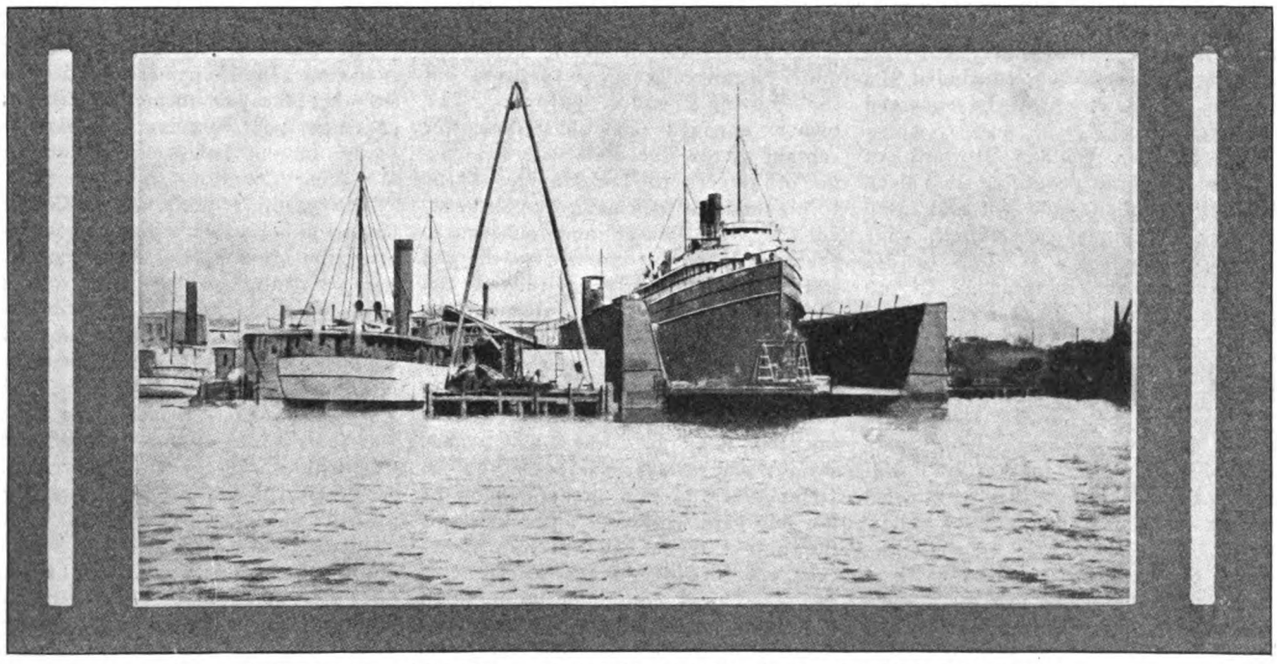
THE MARINE REVIEW

VOL. 45 CLEVELAND APRIL, 1915 NEW YORK No. 4

The Merrill-Stevens Plant

This Shipyard is Now Being Equipped With Electric Drive and is the Most Resourceful Plant South of Newport News—Busy at Present on Repair Work

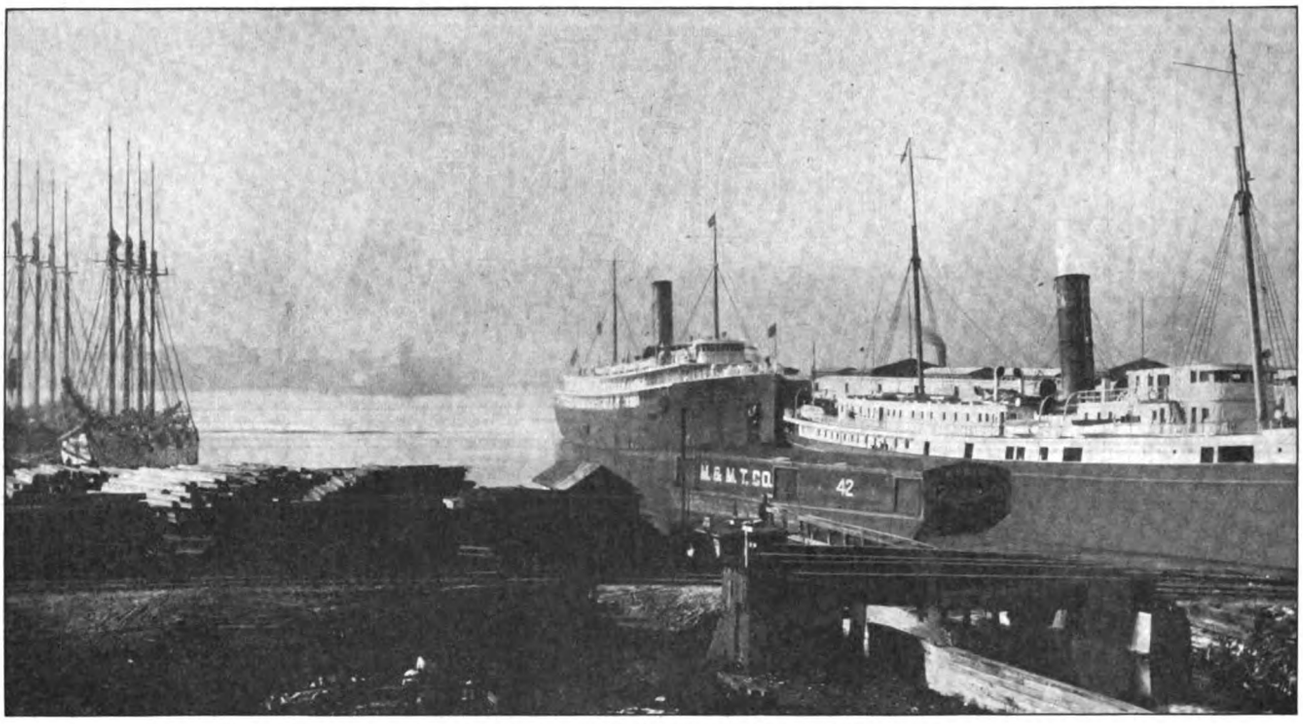


THE MERRILL-STEVENS CO.'S PLANT AS SEEN FROM THE ST. JOHNS RIVER

THE Merrill-Stevens Co., Jacksonville, Fla., are at present engaged in the work of dismantling their steam engines and substituting electric power throughout the entire plant. Contract has been given to the General Electric Co., Schenectady, N. Y., for the installation of about 20 motors, aggregating 350 horsepower. This is the direct result of the establishment by the city of Jacksonville of a municipal electric plant. Power is furnished by the city at the rate of 2 cents per kilowatt hour. The Merrill-Stevens Co. figures that at this rate the actual saving in cost works out at 25 per cent, to say nothing of the advantages of cleanliness and convenience of electric drive. A new air compressor will shortly be installed in the plant.

With the exception of a small ferry the ship yard has had no new work in hand lately, but it is quite busy on repair work, largely wooden. The government dredge Sumter is now in dry dock undergoing general repairs aft, including new stern post and rudder. The work on her stern amounts to a rebuild and she had to be held together and held up at the same time. However, she will be a pretty staunch craft when her repairs are concluded. Her stern post is made out of a piece of live oak, 25½ x 25½ inches. Her rudder is also of live oak and will probably be as firm a century hence as it is today. This oak is as hard as rock. It will also sink like a rock, for it never gets dry enough to float. Jacksonville is in the heart of the live oak district. It was from this district that the timbers of the Constitution were cut and the stumps of the old trees, still in the forest, are as solid today as they were

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



THE MERCHANTS & MINERS TRANSPORTATION CO.'S DOCKS AT JACKSONVILLE

when the old warrior was built. As soon as the rebuild is concluded the hull of the Sumter will be sheathed with copper.

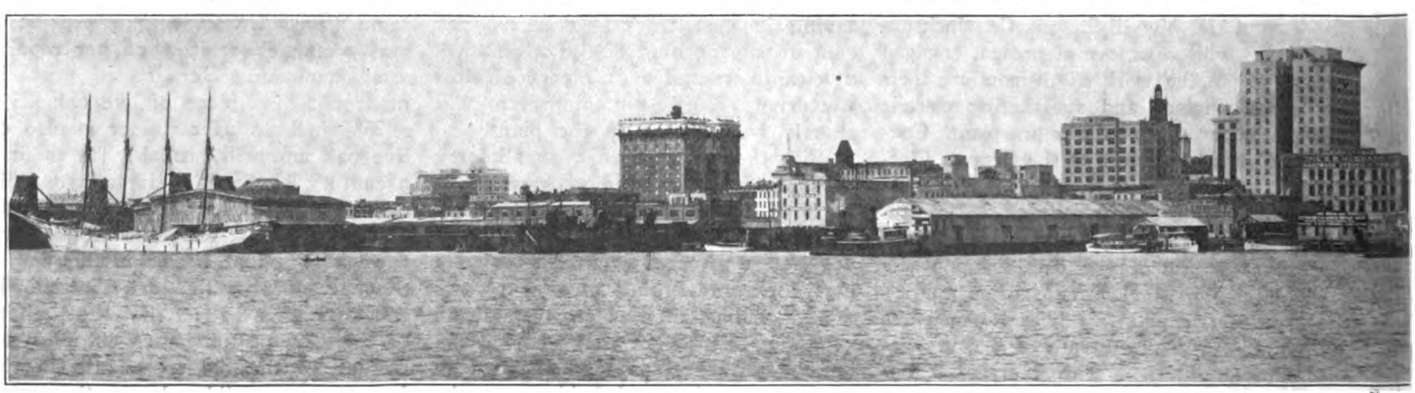
The steamer William Howard, of the Howard Transportation Co.'s fleet, is being lengthened 25 feet and fitted with an overhung stern wheel. She is designed to carry 125 tons on 3½ feet, and as she is intended to operate in very shallow water her bow is so shaped that she cannot be stranded. Prior to her purchase by the Howard Transportation Co. she had rested on the river bottom for four years and is certainly a sorry-looking spectacle, but her old cypress hull will nevertheless outwear the lengthened portion which is being built of yellow pine.

One of the most amusing craft at the yard, if that word may be applied to a vessel, is the Savanilla. She is a flat-bottomed affair and resembles a scow decked over. Her living quarters, which are all below deck, are quite elegant and she was fitted out for moving picture purposes. The owner engaged an old Gloucester captain to tow the craft with her cargo of players to Jacksonville. True to his instincts as a navigator he headed for deep water and subsequent events, while quite prosaic to the old salt, were sufficiently exciting to the players to cause them to abandon the craft at Norfolk. The old captain continued his journey alone and the players went by rail to Jacksonville, which is the rendezvous of several of the film play producers and where several plays were enacted in the St. Johns river to the great delight of the ship yard workers. The reunion of the old craft and the players, however was of too joyous a character and the films consequently suffered. The owner dismissed the company and the Savanilla went to the ship yard for repairs.

The schooner Bradford C. French is having a built-up mast fitted in her, and the Biscayne, formerly a Mexican passenger boat, is being converted into a tug for the Jacksonville Towing & Wrecking Co.

The gasoline yacht Ailsa Craig is having minor cabin repairs made, as is also the Jane III, while power is being installed in a couple of life boats.

The Merrill-Stevens Co. was founded by J. E. Merrill, in 1876, and was later organized as the Merrill-Stevens Engineering Co. A few years ago it was reorganized as the Merrill-Stevens Co., with A. D. Stevens as president; A. R. Merrill vice president, and J. E. Merrill treasurer. The plant covers about 50 acres with a good frontage on the St. Johns river, with 40 feet of water at the dock and with railroad connections running into the yard. Its machine shop is complete and the plant is equipped for boiler



PANORAMIC VIEW OF THE WATER FRONT OF

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

construction. It is organized for dredging, pile driving and salvage work, and also maintains a diving outfit.

Some of the salvage work performed has been quite notable, particularly the release of the four-master schooner Theoline from Nassau inlet, said to be the first vessel ever released from the sands of this inlet.

The floating dry dock of wood is 350 feet long and 50 feet wide and has a lifting capacity of 4,500 tons. It is subdivided longitudinally by three bulkheads of 1-inch plate and transversely by 16 bulkheads of ⅞-inch plate and is unusually staunch. There are also three small floating docks from 25 to 75 tons lifting capacity which are uncommonly handy for hull and bottom repairs to small craft. It is possible to dock a vessel in one of these little docks in six minutes.

As practically one-third of the work of the company is government work the plant is run on eight hours time, it having been found impossible to reconcile the 10-hour day on merchant work with the eight-hour on government work. This, of course, is quite a serious matter in competitive merchant work, but the company has lessened the handicap as much as it can by making a compromise that has proved quite satisfactory to its employes. It has split the difference with them—that is to say, it works them for eight hours and pays them for nine.

The company has the only ship yard south of Newport News capable of docking the average coastwise steamer and is equipped to repair anything likely to put into the port of Jacksonville. The new municipal dock now under construction in Jacksonville and which, it is expected, will be completed by the end of the present year, will give a considerable impetus to its business. This new dock will free the port from any tendency to monopoly on the part of the railroads and will doubtless attract a great deal of vessel tonnage as it will be fitted to handle all classes of freight, having cotton compresses and all machinery for dealing with the peculiar products of the south, and being connected by a belt line with the three railroads entering Jacksonville.

Jacksonville Municipal Pier

The city of Jacksonville, Fla., has been for the past year engaged in the construction of municipal piers in St. Johns river on the outskirts of the city and it is the expectation that they will be ready for service at the expiration of the present year. The city has purchased about 50 acres at this point with a river frontage of 4,200 feet. The piers, two in number, are to be 1,000 feet long and 200 feet wide with a 30-foot fender wharf on piling on each side, making the space available for storing and handling freight 260 feet wide. The pier proper is a solid fill of sand enclosed between sheet steel piling, of which 5,230 feet has been furnished by the Lackawanna Steel Co. The slips between the piers are 260 feet wide. Each pier will have two center tracks and the sheds, which will be fully equipped for handling freight of all sorts, will be 800 feet long.

The city is also building a belt line railroad to the piers connecting with the tracks of the Atlantic Coast Line, Seaboard Air Line and the Florida East Coast railways, as well as with the terminals of the various steamship lines. The city has, therefore, placed itself in quite an independent position as a port and will doubtless attract a great many tramp steamers. The channel to the sea, 26 miles away, is at present 28 feet deep, but the government is now deepening it to 30 feet. The city is putting itself in position to get its share of the trade of South America and the west coast that will gradually develop as a result of the opening of the Panama canal.

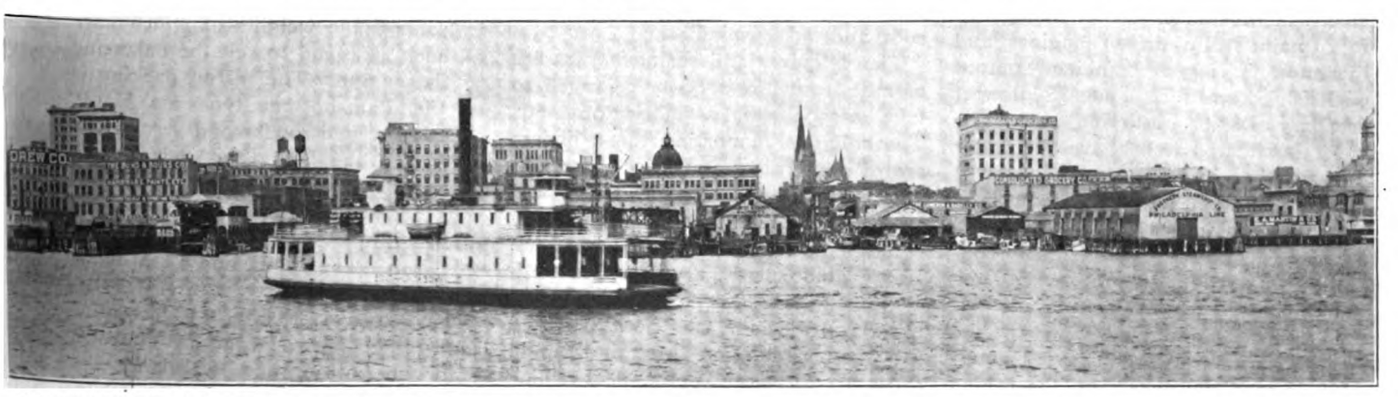
F. W. Bruce is the engineer in charge of the construction of the new municipal pier.

The San Francisco-Oakland Terminal Railways has spent approximately $75,000 during the past year in getting its fleet in readiness for the additional traffic which the company expects incident to the Panama-Pacific International Exposition. The machinery of the steamers has been thoroughly overhauled and the number of life preservers increased to 2,000 on each steamer. The vessels comprising this fleet are the San Francisco, Claremont, Fernwood, San Jose and Yerba Buena. They are built exclusively for the passenger trade and are fitted with every modern convenience.

The Eagle Packet Co., St. Louis, Mo., is adding a new steamer to its fleet, to be called the Peoria. The new boat is 275 feet long, 45 feet beam and 8½ feet deep. She is equipped with two high-pressure engines with a stroke of 7 feet and four boilers, 44 inches diameter by 30 feet long. The main shaft, which was cast at the Krupp Steel Works foundries, Essen, Germany, is 31 feet long by 13 inches diameter. The Peoria has 75 outside staterooms, running water in all rooms and electric lights throughout. The cabin is artistically decorated in tinted paneling made on beaver board.

The steamer Helen C., belonging to the Western Cedar & Lumber Co., Alpena, Mich., is being repaired at Alpena, receiving a new fender rail, some new decking and nearly all new hatches. New iron is being put on the vessel on both sides forward, and some minor repairs to cargo hold are being made; also new coaming under forward house and new after end of forward house, entirely new on the main deck. The steamer received a new foremast last fall.

The Ellicott Machine Corporation, Baltimore, Md., recently launched the seagoing hopper dredge Comstock for the United States engineer department, Galveston district.



JACKSONVILLE, FLA., TAKEN FROM THE ST. JOHNS RIVER Photograph by the Jacksonville Photographic Co.

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Red Star Liner Belgenland

A New Steamer for the Red Star Line Which Will Trade to Antwerp When the War is Over

THE launch of this fine, large passenger steamer by Harland & Wolff, Ltd., at Belfast, on Dec. 31, is a significant indication of the faith of the managers of the line in the restoration of Antwerp to its former position in the commerce between Europe and America.

The Belgenland is a triple screw passenger steamer about 700 feet long and 78 foot beam, with a gross tonnage of approximately 27,000 tons and 33,000 tons displacement. She has been constructed on the latest and most approved principles, the double bottom extending right fore and aft and the watertight bulkheads carried up to the awning deck. There are seven steel decks besides the orlop deck and the bridge deck.

The Belgenland will have accommodation for 660 first class, 350 second class and over 2,000 third class passengers, the first class accommodation including a number of cabines-de-luxe on the bridge deck. In addition to the usual first class dining saloon and reception room, reading and writing room, lounge and smoke room, there will be a children's saloon, room for maids and valets, gymnasium and children's playroom, greenhouse, veranda, swimming bath and electric baths. The second class accommodation will also be very superior, and will include a gymnasium.

Needless to say, the appliances for working ship and cargo will be of the latest type, the steering gear being of Harland & Wolff's well known design, and the steam winches, windlass and capstans being the most powerful, efficient and up-to-date. There will be a large refrigerating machinery plant.

There is a large and very complete electrical installation consisting of four main steam driven engines and dynamos, having a combined output of 1,200 kilowatts and one 75-kilowatt auxiliary Diesel oil-driven set. The latter is situated well above the water line, so that in case of emergency it can supply lighting throughout the ship, wireless telegraphy, boat winches, as also operate the electrically controlled watertight doors when the four main sets are for any reason put out of action. In addition to the lighting, which will consist of about 4,500 25-candlepower lamps, the cabins are electrically heated, and there is a complete system of warm air, ventilation and suction fans, the control for all of which is grouped together at a central point, enabling the air to be kept fresh and the temperature normal at all seasons. Among other electrical apparatus there are passenger elevators for convenience in getting from one deck to another, as also electrically operated hoists in connection with the stores. The boat winches are also electrically operated, and there are in addition a number of service machines in the galleys, bakeries, etc.

Propelling Machinery

The propelling machinery of the Belgenland consists of two sets of reciprocating engines driving the wing propellers, and one low pressure turbine driving the center prepeller. The reciprocating engines are of the inverted direct acting four crank triple expansion type, balanced on the Yarrow Schlick & Tweedy system, having four inverted direct acting cylinders, 35½, 56, 64 and 64 inches in diameter x 5 foot stroke, and designed for a working pressure of 215 pounds per square inch. The turbine is of the Parsons reaction type and designed to operate in the ahead direction only, by exhaust steam from the reciprocating engines.

The design generally is that adopted by Harland & Wolff, Ltd., and in construction the machinery embodies the builders' chief features and high class character.

All the cylinders are independent castings of high grade cast iron with liners fitted to all of them, the bottom of the cylinders being double, and strongly ribbed and arranged with loose boxes for carrying the metallic packing which is fitted for the piston rods and valve spindles.

The cylinders and casing covers are of cast iron, box section, arranged to take escape valves, lubricators, etc. The columns supporting the cylinders are of cast iron, rectangular in section and firmly bolted to sole plates and all cylinders, the tops being securely connected together with tie bars. Loose guide plates are fitted to both front and back (the former being for the ahead motion), and both arranged for water circulation through them in order to carry away the heat which will be produced. The sole plate is of strong cast iron, box section, having nine half round recesses for shaft bushes arranged to take the crank shaft, which is built in four pieces with the angles arranged to suit the balancing of the engines.

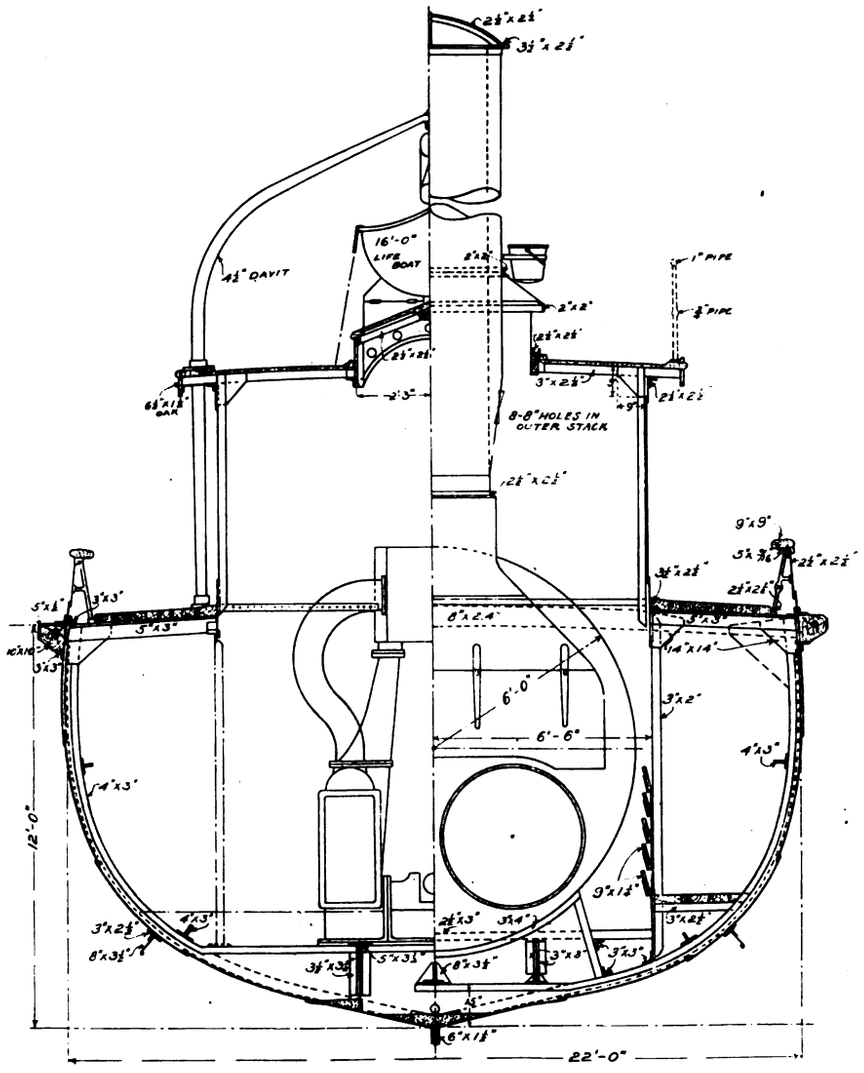
The thrust of each propeller is transmitted by means of collars forged on to the thrust shaft to the thrust block, and is taken up on cast iron shoes lined with white metal on both sides, the weight of the thrust shaft being carried by two bearings, one at each end of the thrust block.

All the shafting throughout the ship is of Siemens Martin ingot steel, made by Messrs. John Brown & Co., Ltd., Sheffield, the plummer blocks for carrying same being lined with white metal of Harland & Wolff's best quality, while the propeller shafts are fitted throughout the stern tube with a gunmetal liner in one piece. The whole of the shafting is considerably in excess, as regards strength, of that required by the board of trade or Lloyd's rules.

The stern tubes are of cast iron fixed into stern frame and stern post by wrought iron nuts outside and bolted with flange to bulkhead on the inside. Gunmetal bushes lined with lignum vitae are fitted to the stern tubes, the inner end of forward bush being arranged with stuffing box and gland. The wing propellers are fitted with three loose manganese bronze blades, each on a cast steel boss, the blades being secured to the boss with steel studs and forged bronze cap nuts, while the turbine propeller is of solid turbadium alloy, and on the aft end of each boss cast iron cones are fitted over the propeller shaft nuts.

The high pressure pistons are of cast iron, the intermediate pressure and low pressure of cast steel of conical shape, the weights of which have all been arranged to suit the balancing of the engine. The piston packing is of the Ramsbottom type for H. P. and I. P., and Lockwood & Carlisle for L. P., the junk rings being made specially deep for guidance as no tail rods are fitted, all the cylinders are fitted with piston valves of hard, sound cast iron. The H. P. and I. P. cylinders arranged for steam to enter between the valves, the top piston in each case being larger in diameter than the bottom one to balance the weight of the valve and gear, while.

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



LOOKING FORWARD THROUGH ENGINE ROOM AND BOILER ROOM OF SURVEY BOAT

six frame spaces aft of the stem and also suitable doublers in way of the air ports. The form of steel deck house is shown in the outboard profile. All outside doors in the house are of steel.

The propelling engine is surface condensing, fore and aft compound, with cylinders 16 and 32-inch diameter by 24-inch stroke, allowed a pressure of 175 pounds per square inch. The high pressure valve is of the piston type and the low pressure valve, double-ported slide.

The boiler is of the Scotch type, 12 feet in diameter and 11 feet 2 inches long, designed to stand a working pressure of 150 pounds per square inch.

The equipment of pumps is complete, including air pump, circulating pump, feed pump and sanitary and fresh water pump.

The steamer is lighted by electricity, a 5 kilowatt 110-volt General Electric turbo generator being fitted in the engine room. The steering gear is of the Williamson type.

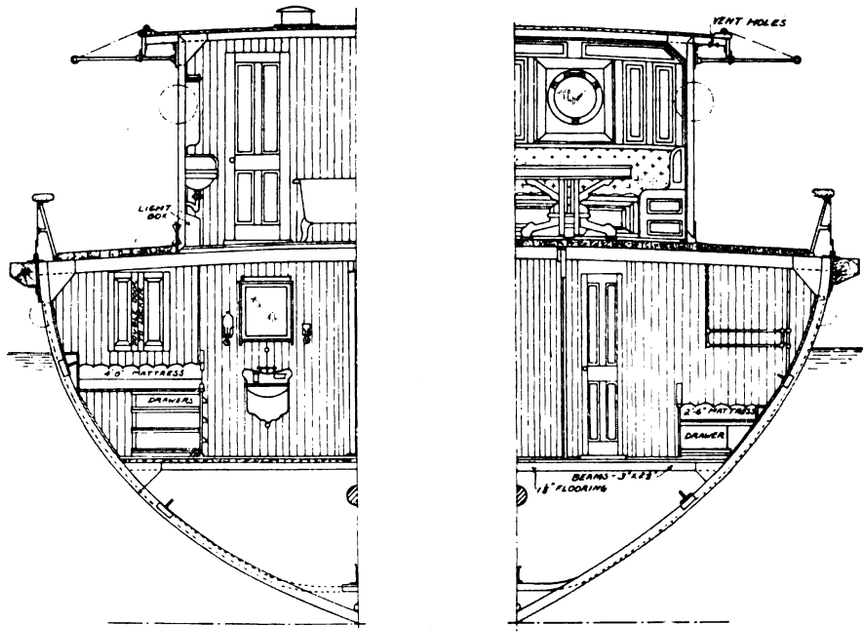
At a recent meeting of the Great Lakes and St. Lawrence River Rate Committee, held at Toronto, John F. Pierce, general passenger agent of the Canada Steamship Lines, Ltd., was elected chairman, and James Morrison, assistant general passenger agent of the Canadian Northern railway, was elected secretary for the ensuing year. This committee consists of vessel owners of the United States and Canada operating on the Great Lakes and St. Lawrence river. No important change in rates was made.

The W. & A. Fletcher Co., Hoboken, N. J., have received contract from the Fort Lee Ferry Co., New York, for the construction of a new ferry steamer, 200 feet long by 61 feet beam, with accommodations for 1,200 passengers. The contract for the hull has been sublet to the Harlan & Hollingsworth Corporation, Wilmington, Del.

Alterations on the Old Dominion Line steamer Jefferson are completed and the vessel left the yard of the Newport News Shipbuilding & Dry Dock Co. recently to resume her trips. The alterations included the building of steel compartments in the hull of the Jefferson, which are watertight, and the installation of a new set of boilers.

The battleship Pennsylvania, building at the yard of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., will be launched March 16.

The William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa., has received contract for three steel barges for the Isthmian Canal Commission.



FRAME 19 LOOKING AFT; FRAME 17 LOOKING AFT, SURVEY BOAT

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Jupiter's Electric Drive

W. L. Emmet Relates the History of the Application of Electricity to the Propulsion of Warships—Highly Valuable Discussion

FOLLOWING is W. L. Emmet's discussion on Lieut. S. M. Robinson's paper on "The Application of Electrical Propulsion to Battleships with the Experience Gained with it on the Jupiter." The abstract of the paper was published in the March *Marine Review*. Mr. Emmet said:

W. L. EMMET: My recent utterances before this society on the subject of electric propulsion have consisted largely in railings at the officials of the navy and others for not adopting it. But I no longer have that ground for complaint, inasmuch as the navy department has come out very handsomely in favor of electric propulsion lately. The officers of the bureau of steam engineering have proceeded with great care and thoroughness to study the operations of the Jupiter. Admiral Griffin has sent his principal officers of the bureau to see the Jupiter, one as commander and another to inspect her trials, and everything possible has been done to bring out the facts and all the interesting comparisons, and having made this investigation Admiral Griffin has acted with positiveness and without reservation in his recommendations to the department concerning the adoption of this method of propulsion for the battleship California.

Superiority of Electricity

The use of electricity for the propulsion of a ship is suggested simply by the superiority of the high speed turbine, superiority not only in economy but in simplicity and in weight. It was about six years ago that I first advocated electric propulsion of warships, but long before that I and many others had thought of it as a possibility which might or might not be worth pursuing. I have always thought that there are thousands of possible engineering enterprises which a skilful engineer can develop to a high state of usefulness. The merit lies not in thinking the idea, but in bringing it to a thoroughly practical and useful application.

It was about the year 1897 or 1898 when we first made arrangements with Mr. Curtis to build the Curtis turbines, or at least begin to experiment with the Curtis turbines. When the contract was drawn with Mr. Curtis, E. W. Rice of the General Electric company, put a clause in that contract relating to electric propulsion, that is, Mr. Curtis reserved the right to use his turbines for marine propulsion, but Mr. Rice wrote into the contract the words "except when through the medium of electric motors" or some words to that effect, showing that he considered electricity a possibility wherever power transmission had to be done in a compact and simple and reliable way.

The strength of the case of electric propulsion has steadily gained ever since I first discussed the subject before this society, because high speed turbines have become steadily better, and as they have become better they have become lighter and higher in speed, making more necessary suitable means of reducing the speed in any desired ratio. My first proposition to apply electric propulsion was in connection with a battleship, as I have always made it a practice in engineering to figure the best case first, I try to select the things on which to exert my energies which will bear the most fruit in a single operation rather than to take something in which the possible result is only a little better. I realized that the great merit of electric propulsion lay in its application to a battleship where there was necessity for high speed with a minimum of boilers and where the desire for good economy at low cruising speed was very great.

When the question of equipping the Jupiter came up I rather protested against putting an electric plant into the Jupiter, because she was a ship of one speed, and while I knew I could make an enormous gain over any other propelling system in existence, I knew that the relative gain would be nothing like so great as if I could install the system on a battleship. The Jupiter requires about 7,000 horsepower, and is a very large, low speed vessel. She runs practically at one speed, and there is no particular occasion for changing the ratio of speed in such a ship. The demonstration which has been made on the Jupiter is a very important one in marine engineering, and in spite of the fact that I did not consider it a desirable case, and hesitated to take it up, lest we should not make a sufficiently striking demonstration. This paper reports the Jupiter as about 25 per cent better than her sister ships. The sister ships are as good as any ships afloat, with very good engines in them. The trials of the Cyclops showed what was considered a phenomenal performance, but the gain in Jupiter is in reality, I think, more than is indicated by tests, since her auxiliary arrangements are very imperfect and involve a great waste of steam. In the trials of the Jupiter the steam consumption for auxiliary purposes were reported as about 20 per cent. The reason for that was that in order to hold a good vacuum on the main unit they had to hold the pressure above the atmosphere on the auxiliaries, and were exhausting the auxiliaries into the main condenser. The auxiliary economics running with back pressure were extremely bad, turbine units, some of them, and the steam consumption was outrageous.

Breaking of a Bolt

There are one or two things in Mr. Robinson's paper relating to the Jupiter I think I might explain. The breaking of a bolt in the first stages of the Jupiter when she was on her trial was probably due to a fact, as he mentions in another part of the paper, namely, that there was an immense amount of water passing through the turbines by violent priming. There was so large an amount of boiler compound in the boiler that the outside of the turbine was encrusted with solids from the boiler compounds which primed over into the turbine and was forced out at the valve stem. The shock from this water undoubtedly broke the head off one of three bolts that held the stationary buckets. The ship came in under her own steam with the bolt broken. That illustrates a great advantage of a turbine of this type which is practically nine separate turbines in separate cases. If anything happens to one of them, you can lift off the top and clear that element so it will run, and the remainder of them will run the ship with only slightly less efficiency. Another point is that an electrical alternator is not exactly a unit, but is an assembling of a great number of magnetic circuits, in separate coils, and is not likely to be injured so it cannot be reconnected in some way so that it will run by a man who understands. I guarantee that I can give a man a little while with a pickaxe on the Jupiter's electrical apparatus, and if I had a few hours at it I would get it running again, because there are ways of doing these things. People who understand that kind of electrical apparatus can do all sorts of things with it which would

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

seem to be most difficult at a glance to the layman.

The comparison which is now most interesting in this connection is that with the geared turbine, which has become most important as a method of ship propulsion. From the demonstrations which have been made with both of these methods, it is obvious that no ships should be run with reciprocating engines or direct turbine drive. The geared turbine is subject to various limitations as compared with the electric driven method, which have sometimes been overlooked. I had a geared turbine set running in Schenectady driving a 500 killowat generator. I decided to determine what the losses in reversing a turbine would be, so I ran the generator as a motor, first in one direction with various pressures, with various degrees of vacuum in the casing, and then in the other direction with the same conditions. We delivered ten kilowatts to the motor by running the turbine ahead and delivered over 70 kilowatts to the motor by running it backwards, that is against the direction of the buckets. It appears, therefore, that turning these buckets in the reverse direction takes some power. The degree of loss will depend upon circumstances and in some of the higher speed and best turbines, the loss will be very considerable. If., however, we want the best, we can not make concessions in the design of the turbines, we must go to the limit in speed and in every characteristic, or else we will lose more than the electrical losses. The mechanical losses of the gears amount to something, maybe a percent or two, and the additional number of bearings involved through the necessity of alignment of the gearing and the supporting of weights and thrusts or pressures from the gears involve additional losses. The reversing turbines, as has been stated, involves losses, and if it is to give powerful and effective reversing power, which is important on any ship, its losses will be considerable. The electrical losses in the California design represent less than 8 per cent, and the turbines are of ideal efficiency.

Could Drive Lusitania

To give you a conception of how such a turbine compares with the turbines used to propel ships, there is a large turbine which we are operating here in New York, and tested within the last few days, which delivers 30,000 kilowatts. At about 25,000 kilowatts, or possibly 27,000 kilowatts, two of these machines would be capable of driving the Lusitanea. The efficiency of that machine is 75 per cent of the theoretical work in the steam, that is, delivered electrically to the busbars. If we took the electrical losses out of that, which will amount to about 5 per cent, we will raise that to about 77 or 78 per cent. The Lusitania's turbines, which I suppose are the most efficient marine turbines in the world, are about 63 per cent efficient, so you have a comparison of two things, for the same purpose, except for the auxiliary arrangements of the turbine of 78 per cent efficiency, as against the one of 63 per cent efficiency and in such a case the electrical losses could be at least compensated for by using lower speed propellers which would be much more efficient. The Jupiter's turbine is not so good as that, quite, because it is not so large, and it is only in the largest turbines we can get the best results. The California's turbines at the best speeds will be about as good as this highly efficient machine which I have mentioned.

Asking a Few Questions

In turbine drive of ships you can make practically no concessions as to the speed of the turbine, or, for that matter, you can make no concessions as to the speed of the propeller, without sacrificing the electrical losses.

In the study I made of the Pennsylvania, the bureau of Steam Engineering made a study of propeller possibilities on that ship for our company, in order that I might look into the possibilities of the case. They showed that the efficiency with four propeller shafts on the Pennsylvania, operating at 160 revolutions per minute, which I proposed, was about 8 per cent better than operating at 222 revolutions per minute, which is to be used on the turbine-driven Pennsylvania. The turbines which are going into the Pennsylvania have an efficiency of about 61 per cent, I should judge, at full speed, and the turbines that I am putting into the California have an efficiency of about 75 per cent and the difference of propeller efficiency in our favor would compensate for the electrical losses.

JOHN F. WENTWORTH: I did not come prepared to do any speaking on any but my own line, but in connection with this subject I hope the fight will be carried, and am interested in having it carried, into the enemy's camp. I would like to point out one or two facts here. For instance, we read that the fuel consumption per S. H. P. varied from 1.66 to 2.50 pounds of coal per hour, but from what goes above, I take it that is on the turbine; in other words, the efficiency of the turbine is around 11 per cent. That means that you are using 11 pounds of coal and throwing away 89 pounds of coal.

As far as comparing different ships goes, it reminds me a good deal of an experience I had in Washington one time. I ran up against a man who tried to get me to back him. He had some mining machinery of some kind on the Potomac river, and had some stamps up there. He had an idea about the efficiency to be obtained by using water as a fuel. He said that these stamps were using the full capacity of the boilers, and had got to do something, and that he was going to put water under the boilers in connection with his fuel, and put in more stamps, and show clearly that he obtained energy from decomposition of the water, and subsequently reunited again the hydrogen and oxygen. It seems to me in an engineering proposition the whole thing should be gotten down to the factor of the coal pile or the oil tank, so that we know where we stand. To state that a turbine is seventy-five per cent efficient, it seems to me, is misleading. I do not quite understand what that means, but it is a fact when you shovel your coal under the fire and take your load off the shaft, you only have 11 per cent.

I would like to ask a few questions. Why not investigate the possibilities of the internal combustion engine as it can be developed when considered as a thermodynamic problem? Can not the oil engine be built in low pressure type without a sacrifice of efficiency? Cannot this type be built in cylinder sizes of 60 to 72-inch bore? Cannot this type of oil engine run at all the piston speeds now used in reciprocating steam engines? Cannot this type of plant show a greater efficiency at partial load than any known plant? I believe all this to be possible.

Is it not a fact that in the proposed electric plant in order to produce 1,000 horsepower in the motor it is necessary to have over 1,050 horsepower in the generator, 1,100 horsepower in the turbine, and boilers large enough to drive these turbines? Does this not mean 3,150 horsepower in the machinery to produce 1,000 horsepower on the shaft, besides the boiler?

Efficiency of Steam

Suppose your steam plant has an efficiency of 14 per cent, do you not lose ten per cent of this, owing to the extra machinery interposed? Then again, do you not lose around another ten per cent on account of the interest charges on this extra plant? I think you do. Then, again, where your steam engine efficiency is limited to around 12 per cent, is it not possible to build a reciprocating oil engine in which the efficiency (based on brake horsepower shall be over 36 per cent, and perhaps 40 per cent? I think this will be found to be true, if thoroughly investigated. By that I mean, analyze

Generated on 2024-07-26 09:45 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

your fuel, get your British thermal unit, multiply your British thermal unit by 7.78, and get your foot-pounds of energy in one pound of coal, and then divide these foot-pounds by 60—that will give you the horsepower that you can get out of one pound of oil for 100 per cent efficiency, and you will find you will have to use perhaps 2.5 pound of oil to get the worth that you figure out from one pound of oil.

What can the constructor and ordnance expert not do with this saving in fuel weight and machinery weight, or what can the tactician not do with this increased radius of operation? The solution of the problem of coaling at sea shows up the advantage of fuel economy in that connection.

Is it worthy of the engineer to waste his time and to spend such amounts in unnecessary machinery for a gain of fractional percentages in efficiency, and disregard the possibility of an increase of 300 per cent in efficiency coupled with a corresponding increase in either speed, steaming radius, or offensive and defensive qualities, or a happy combination of these three factors producing a better all round battleship?

LUTHER D. LOVEKIN: I have taken quite an interest in this proposition of the electric drive during the last year. I have sympathized with Mr. Emmet very much in the past five years in his efforts in the direction of the electrical propulsion of battleships, and I congratulate him now on the success which he has thus far achieved. I had occasion to design some vessels, one of them about 8,000 horsepower, and one of much larger power. I investigated the geared turbine proposition, one of which was building, to use oil fuel. I also investigated the oil engine proposition, and last, but not least, the electric drive. The oil engine has many disadvantages, contrary to the statements of the previous speaker. We know that an oil engine runs at about ½ pound of oil per horsepower, and we also know that we have geared turbines now that can go on one pound of oil per horsepower, so that there is hardly a ratio of three to one. With the electric drive we can do equally well.

90,000 *H. P. on Twin Screws*

As regards the efficiency, I have not gone into that question very deeply, but I know it is more than 11 per cent, or we would not be using it. The great advantage that we found in the electric drive over others was in the high propulsive efficiency we could get.

In Mr. Robinson's paper, where he refers to the advantages due to the use of twin screws, exception might be taken to the statement of twin screws being used on battleships of larger power, but inasmuch as I have had occasion quite recently to design an installation of power in which 45,000 B. H. P. could be used on one screw, and yet retain its efficiency, I think that for our Navy, at least, we can count on twin screws being entirely within reason. There is hardly any doubt of our being able to use twin screws for a battleship of at least 90,000 B. H. P. That I am positive of.

As regards fuel consumption, I feel safe in stating that we can get along with less than one pound of oil per horsepower for all purposes. That does not constitute the main unit alone, but all units, auxiliaries included. Our figures have proven that.

Another advantage with the electric drive is the fact that you can make a really electrical battleship, using your power at that very conservative rate of, say one pound of oil per horsepower, and using very efficient turbines for generating the current for driving the auxiliary machinery, instead of using from 100 to 200 pound of steam per horsepower, as we are doing today in lots of our auxiliaries on battleships.

I feel it my duty to move that this society offer its congratulation to Mr. Emmet for his painstaking work in bringing about a new means of propelling vessels, and particularly battleships, which marks a new epoch in marine engineering and goes far into that most important question of the day, viz., the conservation of our natural resources.

I think Mr. Emmet has done more than any one else to bring about that result.

Only Two Methods

E. A. STEVENS JR: Mr. Emmet said that the reciprocating engine had no place on board ship, or at least words to that effect. There is one place where I think the use of the reciprocating engine will never die out, and that is in the slow speed work, especially where the vessel is handled by a cheap crew, such as tugs, small tramp steamers, etc. It is true you can get better economy with a geared turbine, or with Mr. Emmet's electrical propulsion turbine, but I do not consider that a high speed machine, such as a geared turbine, relying on perfect lubrication and close attention for its satisfactory operation, will ever be thrown into the hands of a cheap crew. It is like putting a thoroughbred horse in the hands of a man who has been taking care of car horses all his life. What Mr. Emmett says about the reciprocating engine not having any place on board ship I think is a little far fetched.

In regard to the economy of the Jupiter, I would point out that on page 7 of Lieutenant Robinson's paper he says that the propellers were designed by Captain Dyson, and that they show a high efficiency of drive, from 300 to 800 horsepower less than her sister ship. I take that to mean at lower speed she drove at 300 horsepower less, and at higher speed 800 horsepower less. As the result of the trial, we find the Jupiter on the propeller shaft took 7,000 horsepower. That is over 10 per cent saving in the power, and of the 25 per cent of the coal economy, at least 10 per cent, you might say, is gained by having more efficient propellers.

Economy of Jupiter

What Lieut. Robinson has said about the economy of the Jupiter will go both ways, that is, at the higher speeds if the steam turbine had been used through reduction gears on to the propellers, I think she would not have had the same degree of economy at cruising speed. I believe in having all of the machinery in the engine room mechanical, because in the case of any electrical trouble the assistance in making repairs which you would get from among engineers operating the ship would be of little account, as I am quite sure that most of them know but very little about electricity. What they know about electricity they have gained in connection with the electric lighting plant, and they would not know much about an electric power plant employing several thousand horsepower of electricity. Some people might say the reason is because they do not know anything about electricity, and they should learn about these things. That might be, but I think in my own case if I knew a little more about electricity I would be less likely to want it on board ship than I am now.

E. H. B. ANDERSON: I have read this paper with a great deal of interest, and while the author puts forward a good case for the electric drive, yet, it does not seem to me that any great naval power can properly make an experiment using the electric drive for the propelling machinery installation of a modern battleship, taking into consideration the fact that only one of these electrical installations has yet been tried, and that on a smaller vessel and with a very much simpler layout.

As the author points out, there are many methods of ship propulsion, but for the larger size of battleships and battleship cruisers, there are only two methods which are being seriously considered. First, turbine machinery of the direct drive. Second, high speed

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

turbines and mechanical reduction gears.

The former needs no comment, as it is general knowledge that there are turbine machinery installations of the direct drive type now at sea which develop about 100,000 S. H. P. and drive large vessels at speeds in excess of 30 knots.

The latter system is making equally as rapid progress as the direct turbine drive in practically all classes of vessels, and there is now under construction geared turbine machinery which the horsepower to be transmitted through one line of shafting is equally as great as that per shaft of the largest direct drive turbine installations.

Referring to the author's paper, I do not like the idea of using one generator in a battleship to supply current to four motors driving separate shafts for speeds up to 19 knots, and I feel certain that under regular battleship steaming conditions with the other vessels of the fleet, such a scheme will be found impracticable.

Independent control over each shaft is far preferable, and this is obtained with an installation of high speed turbines and gearing.

Nothing is stated regarding the type of drive for the auxiliary machinery units used in conjunction with the generating set, but it is presumed that those directly operated with the main engines will be motor driven.

I understand this type has not proven entirely satisfactory in power stations, unless steam-driven sets are also installed for stand-by purposes, and on board ship the latest battleships are now using steam turbines to drive the boiler room blowers for the forced draft system.

As regards reliability, nothing but years of extended service will prove this, but it is worthy of notice that Jupiter has not been free from the somewhat regular accidents common to every type of a marine engine.

Astern Turbines

Backing or astern turbines are not giving any trouble due to blade strips, and I have not seen a case of a blade strip in any one of the four U. S. Battleships which have reaction turbines.

As regards economy, the trial data of the Jupiter does not appear to show any special gain either in the water measurements or in the coal consumption records.

Dealing with the questions of space and weight, it is somewhat difficult to say anything definite on these points until one has a case to consider, but I believe the new design of motor proposed for a battleship will weigh considerably more than the type of motor in the Jupiter. I believe any advantage in weight would be largely in favor of the all gear turbine drive.

For a battleship of 33,000 S. H. P. and 21 knots, the weight of the turbines only for a four shaft drive are from 550 to 600 tons, and for four shaft all-gear installation from 320 to 350 tons.

I strongly recommend all interested in this subject to read Lieutenant Robinson's papers in the *Journal* of the American Society of Naval Engineers for November, 1913, and May, 1914, which deals largely with the Jupiter, and in one of them the author specially refers to the question of personnel, which is a vital factor in the ultimate success of the form of drive.

Lieut. Robinson, his brother officers and mechanics are to be heartily congratulated on the great success they have achieved with the pioneer installation of electric motors for propelling a large ocean-going vessel.

River Terminal Conference

The River Terminal Conference with delegates representing the various western river commissions, met at St. Louis on Feb. 19. Eight Mississippi valley states were represented at the conference which was presided over by Adolf O. Eberhart, formerly governor of Minnesota. I. W. Moore, city attorney of New Orleans, explained the desire of New Orleans to co-operate with other Mississippi river points for the upbuilding of the Mississippi river trade. He said that the city of New Orleans had built and now controlled wharves and docks to take care of the expected increased river freight movements. Richard Clarke Wilson, consulting engineer for the New Orleans Association of Commerce, explained that the expense of river traffic could be diminished by building of steel barges so designed that they could be unloaded direct into seagoing vessels. William F. Becker, president of the Minneapolis City Commerce Association said that definite steps had been taken for a revival of Mississippi river traffic, although there had been no large boats plying to Minneapolis in 60 years. A. W. Mackie, of Kansas City, assistant to the president of the Kansas City-Missouri River Transportation Co., which operates the barge line between Kansas City and Missouri, told the conference how Kansas City had established terminals and had made river transportation pay by cutting the cost of transportation 20 per cent below the railroad freight rate.

At the banquet in the evening, S. A. Thompson, of Washington, secretary of the National Rivers and Harbors Congress, was the leading speaker. He said that unless St. Louis and other cities situated on the Mississippi and other western rivers developed their terminals and built boats for freight transportation, the Panama canal would be of no avail.

"Do you river enthusiasts and experts assembled here tonight know that it costs less to ship goods from New York to San Francisco than it does to send by rail goods from St. Louis to San Francisco?" Thompson asked.

"The costs on a hundred pounds of freight from New York to San Francisco by way of the seaboard is 30 cents, while the railrate from St. Louis to San Francisco is 75 cents a hundred pounds.

"The result will be that if you Westerners do not develop your river facilities you will have none, and your prosperous towns will begin to retrograde."

Thompson declared that eastern seaports will get their business if St. Louis and other thriving river towns do not reach out for it. He said river terminals, to handle and store freight, and up-to-date boats are needed.

Ship Building on the Coast

Shipbuilding continues uncommonly active on the coast. Since the Ship Building edition of the *Marine Review* was published, coast shipyards have received additional orders, bringing the total merchant fleet under construction up to 23. The Standard Oil Co. has placed two tankers with the New York Ship Building Co., and the Atlantic Coastwise Transportation Co. has awarded two more contracts to the New York Ship Building Co. W. R. Grace & Co. have given contract to Cramp's, Philadelphia, for a large steamer.

The United States destroyer tender Melville was launched from the yard of the New York Shipbuilding Co., Camden, N. J., on March 3, and was christened by a granddaughter of the late Admiral George W. Melville. The tender is 400 feet long x 54 feet beam x 36½ feet deep and is specially equipped as a supply depot and repair ship. Her duty will be to accompany the torpedo boat destroyer flotilla.

The steel steamer Northwestern of the Alaska Steamship Co.'s fleet is at the yard of the Seattle Construction & Dry Dock Co. for repairs. She will be converted into an oil burner, using the Dahl oil burning system. Her awning deck will also be extended and she will undergo extensive interior alterations.

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Isherwood System of Construction

The Plan Shows the Bow Plating and Framing— Want of Liners on the Outside Strakes of Plating

By Robert Curr

THE plan herewith shows the bow plating and framing. The collision bulkhead is omitted which was shown in the tenth article, June, 1913. The center keelson does not run through the collision bulkhead, but is in one piece from the bulkhead to intermediate transverse *a*.

Transverse No. 1 and intermediates *b* and *c* are connected to the center keelson with angles, similar to the ordinary floor plate.

The floor plates on *b* and *c* are in depth equal to the center keelson and flanged on top.

The frames for *b* and *c* are of angle 6 inches by 3 inches by 9.8 pounds per foot and connected to the longitudinal *K* which is turned, in order to make the connection easier.

Perhaps it would be a better arrangement to have the flanges looking up clear of the cargo space and bunkers. In some cases the arrangement, as shown at *K* has been preferred in the cargo spaces. In this arrangement the channels would be required to be cleaned out every trip when bulk freight was carried unless ceiling was fitted on front of the channels.

The transverse No. 1 is flanged to the shell and deck plating and transverse *a* to the shell and on top.

This effects a saving in the number of rivets and makes easier construction. The deck plating is omitted here, which can be seen in the eighth article, April, 1913.

Longitudinals *A*, *C* and *H* are bracketed on the foreside of the collision bulkhead and *K*, *M*, *N*, *O*, *P* and *R* run to the stem and are connected together with breast hooks, as shown.

The tank top at side stops at the collision bulkhead and becomes longitudinal *N* before same, as shown on plan.

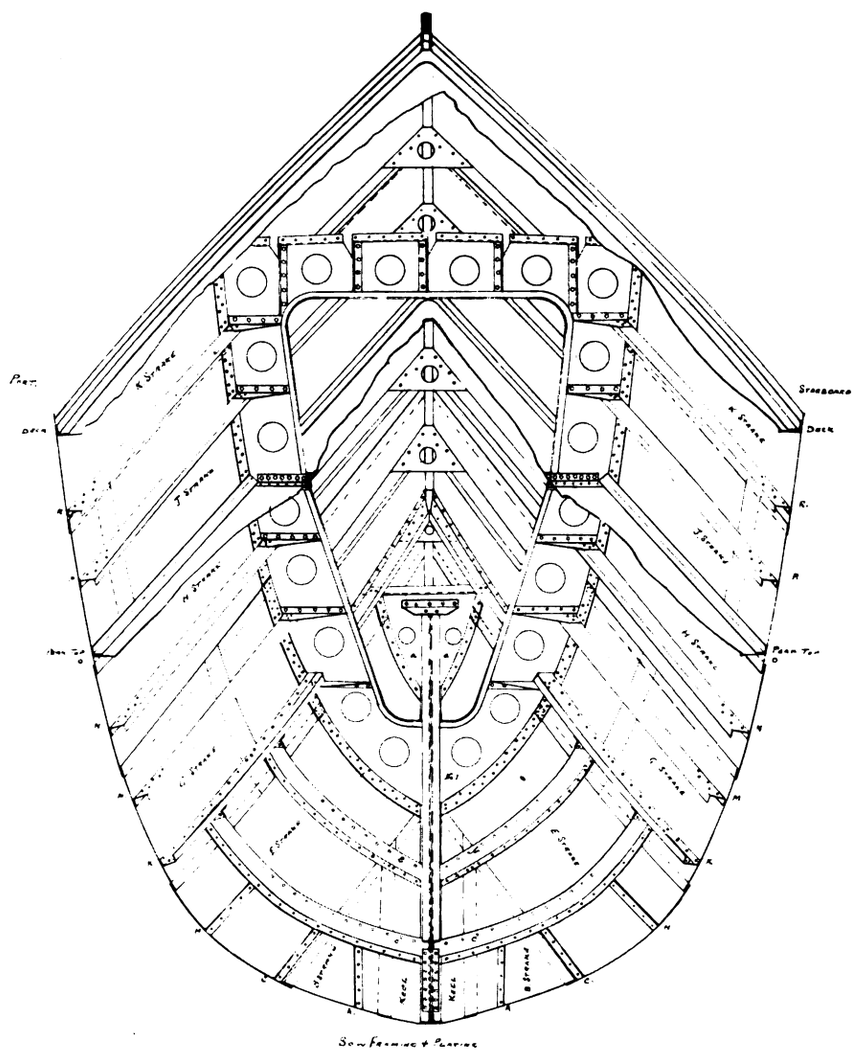
The *O* longitudinal becomes the forepeak deck on the foreside of the collision bulkhead and is watertight to the stem.

The most noticeable thing about this arrangement of framing is the want of liners on the outside strakes of plating and saving of work in beveling, and fitting the cross frames, which are spaced very close in the transverse framed vessels.

The longitudinals, not being beveled, are square and stand at right angles to the plating. The flanged work is made smooth, so that the hollow marks on the plating seen after riveting are dispensed with.

In angles with curvature and heavy bevel it is almost impossible to make the flange to the shell plating flat and on light plating it leaves a hollow in the plate inway of the frame after riveting.

The flanges can be made smooth, owing to there being no heel to contend with, like on an angle.



BOW FRAMING AND PLATING

*This is the twenty-first of a series of articles on the Isherwood system of construction which began in the September, 1912, issue of *The Marine Review*. The first article dealt with the general specifications of the steamer; the second with the sheer, half-breadth and body plans; the third explained the method of getting the sheer; the fourth dealt with the longitudinal and transverse framing; the fifth with offsets; the sixth with the shell plating; the seventh with the shell plating expansion; the eighth with the arrangement of plates and angles forming the spar deck; the ninth with the transverses; the tenth with bulkhead construction; the eleventh with the connection of longitudinal frames to the bulkheads and transverses; the twelfth showed the interior framing between the tank top and spar deck; the thirteenth showed the amount of work that can be put together in a Great Lakes ship yard in a few hours; the fourteenth showed details of riveting in shifts of butts; the fifteenth considered the subject of butt straps and laps; the sixteenth discussed Lloyds rules and their application; the seventeenth shows certain details of the transverse and longitudinal system; the eighteenth gave calculation for the neutral axis and moment of inertia for the transverse framed vessel; the nineteenth showed the materials in the section of the Isherwood vessel; the twentieth showed the arrangement of framing in the engine space extending from frames 24 to 30.

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Power in Life Boats

That every vessel carrying passengers should have a lifeboat installed with power is one of the things that will be required in the near future. The Loew-Victor Engine Co., of Chicago, has demonstrated the fact that a motor can be installed in an ordinary lifeboat and meet all requirements satisfactorily. Two of its motors have been installed in lifeboats on the steamers China and Manchuria, of the Pacific Mail Steamship Co.'s fleet. This order was secured by the G. M. Joselyn Co., the San Francisco agents for the Loew-Victor engine.

The Loew-Victor engine is built offset—in other words the crankshaft is not in the dead center of the machine but is offset about 1½ to 2 inches, varying with the size of the motor. Consequently by installing the motor just a trifle to the port side it is possible to carry the propeller shaft out through the stern of the lifeboat without drilling a hole through the stern post, thus avoiding any weakening of the construction of the boat; nor is the engine set sufficiently out of line to have any influence upon the boat's stability. A single cylinder engine has been installed in one of the China's 21-foot lifeboats, having carrying capacity for 30 passengers. A two-cylinder engine has been installed in a 31-foot lifeboat on board the Manchuria, having carrying capacity of 51 persons. The Manchuria's liftboat thus powered and carrying 51 men and provisions was tested in a heavy gale. The engine drove the boat into the gale at the surprising speed of 7.8 miles per hour and coming about with the wind and tide reeled off 9½ miles per hour.

Some features of the installation are interesting. For instance, the after air tank is used as a gasoline tank having a capacity of 50 gallons. The engine is placed under the after seat and occupies the space of one man. The propeller shaft is very short. The engine can be entirely covered by a sheet iron casing so as to protect it from water. As the engine weighs only 472 pounds, the boat can be handled by the regular davits as usual. The single cylinder engine is only 43¼ inches long, 19 inches wide and 22 inches high.

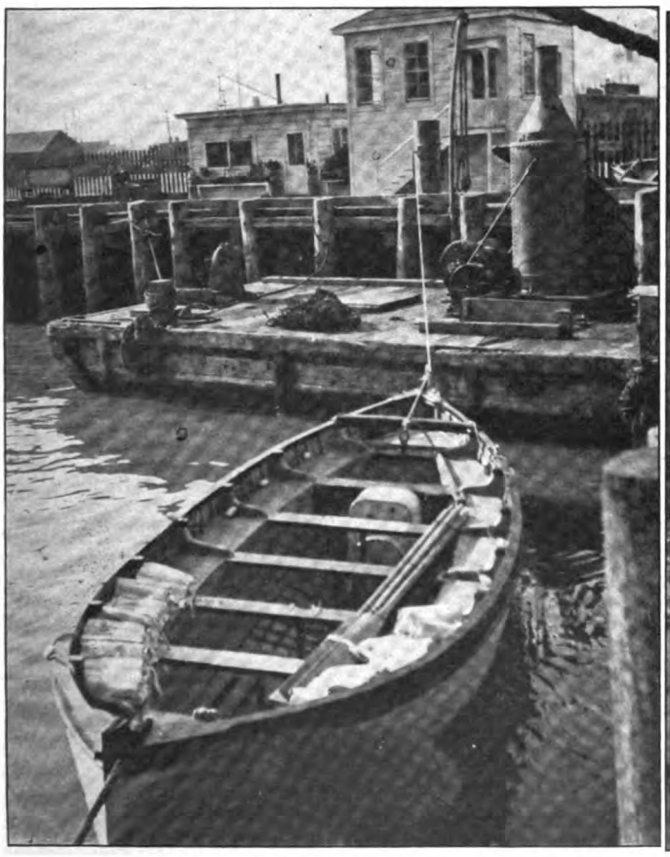
The Puget Sound Navigation Co., Seattle, Wash., contemplates the expenditure of $35,000 in constructing fifty-eight all-steel state rooms in its fast steamship Chippewa with a view to placing it on the Seattle-Port Townsend-Port Angeles route.

Purchase of Vessels

Hutchinson & Co., of Cleveland, have purchased the steamers Price McKinney, Amazon, Australia and Polynesia from the estate of the late James Corrigan. These four vessels have for years carried ore for the firm of Corrigan, McKinney & Co., who are among the largest operators on the Lake Superior ranges. It is presumed, of course, that a freighting contract is involved in the transfer of these vessels and that they will still continue to carry ore for this firm, but actual information on this subject is not obtainable. The deal stirred up quite a lively interest in lake circles and is generally regarded to have materially strengthened Hutchinson & Co. among the independent interests.

Harry A. Farrow has been appointed general manager of the Frontier Steamship Co. and the Niagara Transit Co. with offices in the Rockefeller building, Cleveland. He succeeds W. M. Mills.

The steamer A. G. Lindsay of the Pacific American Fisheries, South Bellingham, Wash., has been rebuilt and renamed Pavlof. The steamer is now of 1,300 gross tons.



LOEW-VICTOR ENGINE WITH METALLIC HOOD INSTALLED IN LIFE BOAT

LOEW-VICTOR ENGINE 6-HORSEPOWER, INSTALLED IN ONE OF THE PACIFIC MAIL STEAMSHIP CO.'S LIFEBOATS

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Marine Electrical Engineering*

The Remarkable Development in This Branch of Engineering — Installation on the United States Collier Jupiter

By H A Horner

ALTHOUGH it is to be expected that electrical marine applications should be rapid, the developments in this branch of engineering in the last five years are remarkable. Minor applications which were in the experimental stage three years ago are now regular requirements for the more severe and larger service. Such equipments as electric bilge pumps, electric steering gear, etc., though they were utilized on certain foreign ships-of-the-line years ago, held no place in our practice until recently. It is a long span from Jacobi's electrically propelled boat of 1838 to the United States fleet collier Jupiter of 1913; but the gap of years contains progress in the art that will stabilize the application.

General Installation

This survey of advancement must be brief. Following the usage of the time 80 volts direct current was first adopted. The battleships Kearsarge and Kentucky building in 1899 were equipped with a 3-wire system using 80 and 160 volts. This precedent led to the standard voltage of 125 volts adopted in 1902. Last year the voltage was raised to 230 volts direct current.

This increase of potential, caused by the expansion of power applications, is disadvantageous to the lighting system and searchlights. The development of the 230-volt tungsten lamp in this country is not such as to insure its adoption at the present time, and searchlight lamps require an arc voltage of 50 to 55. These conditions have brought about the consideration of a system employing either 3-wire generators or 2-wire generators and balancers. Thus there is provided 230 volts for the power system and 120 volts for lighting and searchlights. A standard 3-wire generator has not been adopted and the proposition, therefore, must be classified experimental.

Early in 1913 the standard conduit installation which had for some years been undergoing modifications and experimentations gave place to lead-covered steel armored conductors. This required new designs and methods for its proper installation entailing changes in all the appliances, fittings, and fixtures, throughout the equipment. It has lead to a great reduction in grounds, it reduces the space and weight required for installation, it allows for further expansion, and incidentally presents a less obtrusive appearance.

Much improvement has been sought in the use of special insulating compositions to supersede porcelain. Various types of asbestos lumber, ebony asbestos wood, and like patented preparations are now generally required. Control panels, interior fittings, etc., are constructed of such materials and at the present time seem to give satisfaction. These experiments have lead to the requirement of some such material for the main switchboards superseding slate for this purpose. As this is a recent requirement no switchboards of large size have been manufactured and the questions involved rest in the hands of the designer.

As the tungsten lamp has improved in land practice it now becomes acceptable in marine work. As stated above the voltage (120) is still maintained the same because of the tungsten lamp. Vibrations in certain parts of the vessel naturally in the vicinity of the engine spaces is severe and carbon lamps cannot be entirely eliminated. The introduction of the tungsten lamps has awakened a renewed interest in the principles of good illumination and experiments are now under way with prismatic globes, special reflectors, etc.

Many of the above points and perhaps all combined have brought improved methods of light distribution and the manner of controlling light. This in turn has caused more economical methods of running feeders to centers of distribution and so produced an installation that is far superior to the old methods in cost of upkeep and reliability of service. Incidentally it has tended to simplicity which materially affects the cost both first and last and points to a hoped for standard.

The old automatic magnet control of the arc has now been replaced by the motor operated lamp. Experiments with different compositions of carbon so as to produce greater intrinsic brightness at the source is in progress at the present time. The foreign manufacturer is employing an impregnated carbon which permits a higher potential at the arc, 70 to 75 volts instead of 50 to 55 volts. A lamp using the alcohol spray is under consideration. This lamp is of interest due to the increased illumination. A small positive carbon is used and high temperature of the arc is effected by the use of the alcohol spray. It is understood that impregnated carbons are also employed. It is not known whether any attempts have been made to utilize high power gas filled tungsten lamps for this purpose, but it is supposed that such a field would be promising. The pendulum swings between the advantages of remore electrically controlled searchlights and hand or mechanically controlled lights; but at this time the electrically controlled light is not in favor.

Power System

The steady improvement and continued use of contractors for the control of motors has increased the use of automatic control for a varied number of applications. Dynamic braking, which quickly brings the motor armature to rest, is asserting its certain importance in many equipments.

Electricity is now solely depended upon for weighing the anchor and, although the results of this application for all conditions of service are not known it is reasonable to believe that the application will warrant its continuance.

Experimental work for the last five or six years has brought electrical steering gear into what appears to be a permanent requirement. The older systems tried did not give satisfactory results and it was not until the development of the contactor that experimental work was again resumed. There are now two systems designed which will be shortly tried in service. One is based on the use of two motors controlled by contactors; the other based on one motor controlled by a motor generator on the Ward-Leonard system. Any type of electrical sys-

*Presented before Section D of the American Association for the Advancement of Science at the Philadelphia meeting, December 30-31, 1914. Mr. Horner is chairman, sections committee, American Institute of Electrical Engineers, Philadelphia, Pa.

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tem is today paralleled by the old steam system, but the indications are that the electric gear will supplant the steam.

The introduction of oil fuel instead of coal has changed the electric forced draft fan to a steam turbine driven fan due in part to the fact that high pressure and low volume of air is required and also to the fact that the exhaust from these fans aids the heating of the boiler feed water.

The main drainage pumps are electrically driven, but the application to other main engine auxiliaries has not increased generally. There is a movement toward rotary steam pumps instead of the old reciprocating pumps which doubtless will lead in the end to the electric motor.

Interior Communication

The old types of incandescent lamp instruments have almost entirely disappeared and their place taken by the direct current motor operated instrument. The communicating systems as a whole have increased greatly in extent. No absolute measure of this expansion can be given but it is about 60 per cent.

One of the most important and interesting developments is that of the gyroscopic compass. Since 1852 when Foucault in his laboratory studied the physical action of the gyro, and laid down its laws, scientists and inventors endeavored to produce for it some commercial usefulness. It is not the purpose of this paper to describe or narrate the history of this application. Those who are interested will do well to read H. C. Ford's paper entitled "The Electrically Driven Gyroscope in Marine Work," read before the American Institute of Electrical Engineers at Detroit, June 23, 1914. It answers the intention of these notes to record that recent improvements in the essential point of quickly damping the oscillations has advanced the practical adaptability of this instrument. A demonstration of this improvement was given by Elmer A. Sperry before the 300th meeting of the American Institute of Electrical Engineers, held in Philadelphia, last October.

The improvements in wireless telegraph apparatus have been rapid and important. Most of these advances have been recorded elsewhere and need no further comment. In general the lines of improvement tend to the use of a continuous wave in preference to the undamped wave. Much success has been achieved by the quench-spark system. Matters of practical installation are more carefully looked after, and the value of wireless as a safety factor has not been exaggerated by the press.

Perhaps the most important advance in the protection of vessels occurred in the early part of this year. For many years and by many minds the transmission of sound signals through water was given special consideration. Water as a medium of signalling has many more desirable characteristics than air. The submarine bell attached to the buoy, the lightship or the shore could emit signals such that a vessel equipped with water tank and receiver telephones could evade those places in which there was danger and so be protected in foggy or thick weather. But there remained no under-water means by which a vessel could itself communicate either with the shore or with another vessel. The submarine telegraph oscillator is the work of Prof. R. A. Fessenden, and provides for under water inter-communication by the telegraph or telephone. So much interest surrounds this apparatus that it seems desirable to quote from an abstract of R. F. Blake's paper read before the American Institute of Electrical Engineers at Philadelphia, Oct. 12, 1914. "The apparatus consists of an oscillating electric motor generator which has a strong electro-magnet surrounding a central core on which is an alternating current winding. This copper tube is attached to a large diaphragm. When the alternating current passes through the core winding it induces a current in the copper tube, which, being free to move, vibrates back and forth, thus setting the diaphragm in vibration. This oscillator can also be used as a receiver. From this brief description it can be seen that a most important field is now covered by this apparatus.

Electric Drive

Since Davenport, the Vermont blacksmith, exhibited his electric motor in London many attempts have been made to apply electricity to the propulsion of vessels. Many will recall the electric launches at the Chicago World's Fair in 1893. Abroad some light draft river craft were built and so equipped. A few years ago two electrically driven fire boats for the city of Chicago were successfully operated. A vessel built in England to ply in the Welland canal was equipped with electric motors and Diesel oil engine generators. However the first practical application to a sea-going vessel is the United States fleet collier Jupiter.

The keel of the Jupiter was laid at the navy yard, Mare Island, Cal., on Oct. 18, 1911. The Jupiter was placed in commission April 7, 1913. The vessel was designed for a speed of 14 knots, developing 5,500 s. h. p. with a load displacement of 19,300 tons at a draft of 27 feet 8½ inches. Her performance showed a speed of 14.99 knots developing 7,151.9 s. h. p. with a displacement of 19,452 tons at a draft of 27 feet 7½ inches. She has been in service over a year and a half during which time she has had two trial trips, performed the regular functions of a collier, steamed 14,000 miles, and successfully arrived at the Philadelphia navy yard on a continuous trip from San Francisco stopping only in the Panama canal in order to view the operation of this great engineering project. During this service only two repairs have been made to the propelling apparatus. One of these could have happened to any type of engine; the other was of such minor importance that it need not be mentioned.

Success of Jupiter

The success of the Jupiter is many fold. The fuel economy is shown to be 25 per cent better than the best of light vessels equipped with other methods of propulsion. The propellers are exceedingly efficient giving the same speed as sister ships with a reduction of 300 to 800 horsepower. The manoeuvering qualities of the vessel are markedly superior due to the rapidity of reversal and also to the fact that full power is available for backing. The ship is about 542 feet long and about 65 feet in beam and would be extremely unwieldy if it were not possible to aid the rudder by means of the propelling motors. There are many more advantages but the all important matter is well summed up in the conclusion of a paper by Lieut. S. M. Robinson, U. S. N., read before the Society of Naval Architects and Marine Engineers, Dec. 10, 1914. "After all, the greatest test of the satisfactory working of any machinery is whether or not the men who are actually handling and caring for it are pleased with it. If this test applies to the Jupiter's machinery it certainly is an unqualified success. In particular is this true if the matter is referred to the coal passers in the fire room who have to handle much less coal than do the men on sister ships. The ship can make her contract speed of 14 knots without using forced draft at all."

The success of the Jupiter has led the United States government to extend this application, and electric pro-

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

pulsion is now authorized for the battleship California, now building in the New York navy yard. This equipment naturally will be an advancement over that of the Jupiter. With this development many more advantages may be expected as electricity provides ready means for the accurate measurement and determination of propulsion factors. As the application grows many problems of the naval architect and marine engineer will be reopened doubtless to the betterment of water transportation. There remains to the shipbuilding art today many questions that are settled upon theory because facilities are not given to practically record the conditions of performance. This obstruction will be greatly removed by the application of electricity.

Principle of Electric Propulsion

The first announcement of the principles of electric propulsion of naval vessels may be found in a paper read by W. L. R. Emmet before the Society of Naval Architects and Marine Engineers, Nov. 18, 1909. It is to Mr. Emmet that credit should be given for the introduction of what will doubtless prove to be the best and safest means of ship propulsion; to say nothing of the increased possibilities for the advancement of the art of ship design.

The last half decade is replete with progress in the marine applications of electricity. It is noteworthy that these applications have followed land development in the electric field. From an auxiliary of little importance except lighting, electrical applications of power have grown until now we find electricity entering into the main design of the vessel. The marine engineer is willing to admit that an electric motor will drive a ship, but imagine his astonishment when he finds in the future to what extent the full effect of this application will lead.

Internal Combustion Engines*

By H. F. Fullagar

THE problem of balancing internal combustion engines is in general much more difficult and complex than the corresponding problem with steam engines. The adoption in the former case of the single acting cylinder and trunk piston generally necessitates wider crank angles than with steam. If, on the other hand, a large number of cylinders are employed, vibration arises, owing to the increased length and flexibility of crank case or framing. A further difficulty in comparison with steam practice arises from the sudden and violent increase of pressure when the charge is fired by a spark, which has nothing comparable in the gradual admission of steam pressure to the piston, whilst, when the charge is fired by high compression, the compression stroke produces a severe reversal of torque in the crank shaft and reversal of side thrust between the piston or cross-head and its guide. But while on the one hand the difficulties of balance are greater in the case of the internal combustion engine, the need of perfection of balance is also greater, owing to the purpose for which the internal combustion engine is particularly applicable.

In marine work a very high standard of balance has been set by the steam turbine; for motor-car and aviation purposes an even higher standard is required for the following reasons: When an engine with a very light framing is mounted on a light fusilage, the inertia forces, which are relatively very large, unless well balanced amongst themselves, will communicate vibration to the whole machine. Long distance flying is at present largely a matter of endurance of the pilot, and vibration, apart from its effect upon the engine and fusilage, induces fatigue and saps the nerves of the pilot and marksman.

Absolute freedom from vibration involves balance of two kinds, balance of mass and balance of impulse.

Balance of Mass.—Dealing first with balance of mass, this requires that if the engine be driven by some external source, the inertia forces due to the acceleration of the rotating and reciprocating parts neutralize each other and have no external resultant. Balance of mass is so well understood by members of this institution that it is necessary only to notice very briefly the degree attained with ordinary constructions of internal combustion engines. Balance of the rotating members, the crank-shaft and camshaft, presents, of course, no theoretical difficulty, provided the crankcase is sufficiently rigid to resist the reactions set up.

The inertia forces of the reciprocating parts are of two kinds, primary forces, such as would result if the piston had simple harmonic motion, that is, if the connecting rod was of infinite length; and secondary forces, due to the additional motion resulting from the finite length of the connecting rod. This secondary motion is almost exactly simple harmonic in character, but has double the frequency. Perfect balance or both primary and secondary forces can together be secured only by placing connecting rods on opposite sides of the crank-shaft. If as usual the crank-shaft revolves, the connecting rods must be attached to opposite cranks, but, if the cylinders revolve, both connecting rods can be attached to a single crank. All three constructions can, however, have but limited application.

The ordinary motor-car engine with four cylinders operating upon the four-stroke cycle necessary has its crank in one plane, 180 degrees apart in order to give reasonable uniformity or impulse. In this case the secondary forces are wholly unbalanced. When the plane of the cranks is horizontal, the connecting rod has moved the piston to below mid-stroke by the amount which, if the length of the connecting-rod be four times the crank-radius, amounts to one-sixteenth of the stroke. As this displacement occurs twice per revolution and affects all four pistons, the secondary forces set up are equivalent to the inertia of a single piston moving the whole stroke, but acting with double the frequency. With a connecting-rod of the length of five cranks, the secondary inertia force is four-fifths of this amount. When two such sets of four cylinders are placed together in the "V" type engine, the secondary forces of each set are unbalanced, and their resultant is 40 per cent greater than either and acts in a horizontal plane. The secondary forces of the four-cylinder engine result from the fact that the common center of gravity of the four pistons, instead of being stationary, as would be the case if the connecting-rods were infinitely long, has a small harmonic motion of double frequency. It can, therefore, be balanced by reciprocating

*From the Liverpool Journal of Commerce.

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

or rotating balance-weights, driven at twice the frequency of the main piston. Mr. Lanchester's ingenious method of doing this is to gear a pair of wheels carrying balance-weights to the main crank-shaft, which drives them at double its speed. As the wheels rotate in opposite directions, the components of the centrifugal forces of the weights always balance themselves in the plane through the axes of the wheels, but have a vertical component which balances the secondary inertia forces. Such a four-cylinder engine, though with its cranks in one plane, will have as a whole complete balance of mass, but the method involves calling into play two otherwise useless forces, with some addition to the weight and number of parts. With four cylinders operating upon the two-stroke cycle, the cranks can, of course, be placed at right angles instead of at 180 degrees, and it is then possible to secure complete balance of both primary and secondary forces, with exception of a couple produced by the secondary forces in the plane of the cylinders and crank-shaft, which tends to rock the engine in a fore-and-aft direction. This couple can usually be neglected in practical application. Engines with five and six cylinders in line, with either cycle, can, of course, be perfectly balanced as to the primary, and almost perfectly as to the secondary inertia forces.

Balance of Mass

To sum up, therefore, the only engine constructions in common use in which balance of mass is completely or almost completely secured by the neutralization amongst themselves of the primary and secondary inertia forces are the rotating engine, the engine with five and with six cylinders in line, and the four-cylinder two-stroke engine with cranks at right angles. Of course, also multiplications of these last three of the "V" or radial type engine, in which the parts in each axial plane are balanced, are completely balanced as a whole. All these engines will be vibrationless when driven by an external source, provided the crank case or framing is itself perfectly rigid. In practice, it is not always possible, if the engine is very long, to obtain sufficient rigidity. With the light motor-car type, even if the crank case be sufficiently rigid, it is difficult when the crank shaft is long to make it so stiff that the engine will not tend to vibrate relatively to its fly-wheel, whose mass-center remains almost stationary.

Balance of Impulse.—Balance of mass is, however, insufficient by itself to produce a vibrationless engine, because it takes no account of the violently fluctuating pressures in the cylinders, and the consequent strains in the crank shaft and engine framing. To secure freedom from vibration, it is necessary so to arrange the cylinders in relation to the crank shaft that strains in the framing are either eliminated, or so balance each other as to have no tendency to shift the center of gravity of the engine relatively to its crank shaft and point of support.

Equality of Impulse

If the cylinders are arranged in line and fire simultaneously with exactly equal charges, there will be no tendency for the engine to move, except, of course, to rotate round the crank shaft. Junker obtains this equality of impulse, and, at the same time, a valveless two-stroke engine by his well-known arrangement, but this, unfortunately, is unbalanced as to the secondary mass forces. The three cranks of each cylinder receive simultaneous impulses once only per revolution. The crank shaft of the two-cylinder engine, therefore, receives virtually one impulse for every half-revolution. It will be seen, moreover, that in this, as in all single-acting engines, the pressures on the pistons during the compression and explosion strokes twist the crank shaft first backwards and then forwards, producing a severe condition of stress, whilst the reaction of the crossheads on their guides also alternate in sign with each stroke.

If, however, a second pair of cylinders, each with a pair of pistons, be arranged tandem on the top of the first two, each tandem line is then double acting, and the cranks of the two sets can consequently be placed at right angles, when balance of impulse will be obtained with primary and secondary mass balance, except only as regards the rocking secondary couple in the principal plane of the engine. The torque transmitted to the crank shaft, and the reactions of the crossheads on their guides, will then also be in one direction only. This arrangement, however, involves very great height and large number of parts, together with an expensive form of crank shaft and the same results are obtained more simply, and without these objections, in the author's arrangement. In this, two open-ended cylinders, each with a pair of opposed pistons, are placed closely together side by side, and the upper piston of one cylinder is connected to the lower piston of the other by a pair of external oblique tie-rods. The engine operates upon the two-stroke cycle; the pistons at the ends of their stroke uncovering inlet and exhaust ports, as in the original Oechelhauser arrangement. The complete engine has two such pairs of cylinders, and a second pair of cranks at right angles to the first. The explosions in the four cylinders, acting upon the eight pistons, produce eight impulses per revolution, which are transmitted to the crank shaft in equal pairs. The vertical forces at all times balance each other, and as in Junker's engine are not transmitted through the engine frame.

Secondary forces result from the fact that the common center of gravity of all four pistons and their connecting rods oscillates with an amplitude which, with a connecting rod of the length of five cranks, is equal to 1-20 of the stroke of each piston. This force is, however, balanced by the corresponding force in the other pair of cylinders which oscillates in the opposite phase, and as the two pairs of cylinders are brought closely together, the secondary couple, which alone remains, is much smaller than in Junker's arrangement. With a six-cylinder engine of this type even this secondary couple is entirely obliterated.

The Fullagar engine, therefore, obtains perfect or nearly perfect balance of mass, with complete balance of impulse. Excepting the small secondary couple above mentioned, no vertical forces are transmitted to the engine frame. The only reactions on the frames are the horizontal thrusts of the crossheads on their guides, which are always in one direction, and are the unavoidable equivalent of the useful torque transmitted to the crank shaft. In respect, therefore, of the combination of balance of mass, balance of impulse and good turning effort, this engine is probably superior to any other of the reciprocating type hitherto built.

500 Horsepower Engine

A 500-horsepower engine of this type has been in operation about a year. It has four cylinders of 12 inches (305 mm.) bore and eight pistons with a common stroke of 18 inches (457 mm.) connected to a four-crank shaft. It develops 550 break horsepower easily and its weight, including a fly-wheel of 30 cwt. (1,500 kg.) is under 21½ tons (21,000 kg.). The four pairs of connected pistons weigh approximately two tons (2,000 kg.), and, at normal speed of 250 revolutions per minute, when the pistons have a mean speed of 750 feet per minute (3.8 metres per second), there is hardly any perceptible vibration. Even when the speed is increased to 300 revolutions per minute, giving a

Generated on 2024-07-26 09:46 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

piston speed of 900 feet per minute (4.57 metres per second), vibration is still very slight. At first sight it might be supposed that the oblique rods would involve considerable friction, but the angle of the rods is less than the maximum angle of the connecting rods, and this friction is actually less than would be the case if each of the eight pistons had its own crank and connecting rod. In the 500-horsepower engine above mentioned the mechanical efficiency, excluding the air and gas-pumps, is over 90 per cent.

Condition of Balance

The condition of balance attained with the cross-connected construction of engine above mentioned is all that could be required for almost every application of internal-combustion engine; but there is still one unbalanced reaction of the engine itself, namely, the effort of each successive impulse to rotate the engine backwards round its crank shaft, and there is also the gyrostatic effect of the fly-wheel or propeller which, in the peculiar case of aeroplane engines, it may be desirable also to eliminate.

To Mr. Lanchester belongs the credit of having produced the only engine extensively used in which, in addition to mass balance, torque, balance was secured between the working parts of the engine itself. His well-known engine was fitted to Lanchester cars about 1896. In this, it is sufficient to note, the primary forces were balanced by the balance weights on the crank shafts; the secondary forces of the pistons balance themselves, whilst balance of torque was secured by the oppositely rotating fly-wheels. Balance of impulse was not obtained.

In an engine which secures perfect balance of all forces two opposed pistons in a single cylinder are connected to two oppositely moving crank shafts at opposite ends of the engine. The shafts need, of course to be kept, in phase by a lay-shaft and screw gears or by a pitchchain and spur-gears through the connection has to perform no appreciable work under normal conditions. This arrangement has the further advantage that for aviation purposes two propellers can be driven directly. If of the same area as a single propeller they will, of course, have a correspondingly less diameter, and for the same revolutions have 41 per cent greater pitch ratio, a feature which will considerably increase their efficiency. If two such cylinders are placed side by side, and their connecting rods coupled to opposite cranks, these rods will then balance each other. Such an engine will have absolutely perfect balance of all forces, mass, impulse, torque and gyrostatic effect.

By applying this two-shaft principle to the Fullagar cross-connected cylinder construction, a two-stroke and double-acting engine is produced, in which each crank will receive two impulses per revolution. The engine then consists of two horizontal cylinders with four cross-connected pistons, one piston at either end being connected to separate crank-shafts at either end of the engine. A still better arrangement for the same purpose is one in which a pair of cylinders with cross-connected pistons is arranged in a plane at right angles to that of the shafts. Two such pairs of cylinders can be arranged side by side with the cranks at right angles. Small balance-weights will then be needed to balance the connecting rods, and four impulses will be transmitted to each crank shaft per revolution. As the cylinders in either case work on the two-stroke cycle, an air-pump of some kind is required, the two crossheads of each upper cylinder are arranged to act as blowers—a method which has been found satisfactory.

These engines have absolutely perfect balance, and consequently exert no force whatever upon the fusilage on which they are mounted, except that due to their weight and to the useful thrust of the propellers when this is taken by the engine framing. All the metal in the stationary part of the engine is, moreover, usefully employed to support the engine and propellers, whilst its disposition renders it readily attached to and supported by the fusilage. Such an engine would appear to meet the requirements of aviation more completely than any arrangement yet devised, and, quite apart from the advantages of being "two-stroke" and double-acting, is, so far as the writer is aware, the only arrangement hitherto proposed which secures at the same time balance of both primary and secondary mass forces, balance of impulse, balance of torque and balance of gyrostatic action.

Lake Ship Building

The keen demand existing for deep sea tonnage is reflecting itself on the lakes in two ways, first by an eagerness to charter all available lake craft for ocean traffic and secondly to place actual orders with the shipyards for vessels for coast service. Eastern shipyards are so busy that prompt delivery cannot be had and shipowners are coming to the lakes for new construction. The Great Lakes Engineering Works, Detroit, has received an order from the Atlantic Coast Line of New York for a steamer to be a duplicate of the International, which was built last year. The vessel will therefore be 256 feet over all and will have a carrying capacity of 3,000 gross tons. The new steamer will be built at the Ecorse yard and will be ready for business during the coming summer. Two scows are also being constructed at the Ashtabula yard of the Great Lakes Engineering Works for coastwise trade. The American Ship Building Co. has also booked an order for a new 10,000-ton steamer for C. D. Bradley of Calcite, Mich., to be used in the stone and coal trade. The steamer will be operated in the interests of the Michigan Limestone & Chemical Co. of Calcite and a company will be formed to operate her. She will be of the conveyor type and delivery is promised by August 15.

It is understood that two more package freighters belonging to the Rutland Transit Co.'s fleet have been sold to Atlantic coast interests. The Brandon and Arlington of this fleet were purchased by the Union Coal & Coke Co. last month and are now being fitted for salt water service at the yard of the New York Ship Building Co., Camden, N. J.

Steamer Wm. O'Brien Launched

The steamship William O'Brien was successfully launched at the yards of the New York Shipbuilding Co., in Camden, last month. The new vessel is owned by the Carpenter-O'Brien Co., of Jacksonville, Fla., and is intended for the Atlantic coast lumber trade. She is 361 feet long, 57 feet beam and 27 feet deep, with a gross tonnage of 5,535. She is to make 11 knots an hour under a load. The O'Brien was built especially for the lumber trade between Jacksonville and New York and will carry between 3,000,000 and 4,000,000 board feet of lumber in her holds and on her decks. She has a single steel deck with poop and combined shelterdeck and forecastle. A watertight center line bulkhead runs the entire length of the holds. The forepeak is fitted for ballast and the afterpeak for fresh water. The O'Brien is an oil burner and a large cross bunker for carrying oil is provided for at the forward end of the boiler space. All of the cargo handling devices on this vessel have been reduced to a minimum, as the terminals at New York and Jacksonville are fitted with the latest cargo handling machinery. The new vessel was christened by Miss Alice O'Brien, daughter of one of the owners.

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Port Terminal Problems

A Comprehensive Discussion of the Subject in Which Docks and Railways Are Considered—The Importance of the Belt Railway

By Paul Whitham

THE literature which treats of problems having to do with docks or wharves and railway terminals is confined frequently to one or the other phase separately. As a matter of fact, any broad consideration of port improvement problems should cover both the dock and railway sides of the work. One dove-tails into the other to such an extent that they must be thoroughly co-ordinated and harmonized if the best results are to be obtained.

The expression "marine terminal" may, therefore, be defined as embracing the docks or wharves, railway tracks and yards, sheds, warehouses and the miscellaneous appurtenances and equipment all of which go to make up a complete plant for the purpose of transferring commodities between water and land carriers.

The subject is of such a comprehensive nature that as a matter of convenience it will be treated under two divisions, to-wit:

Part I.—General Problems.

Part II.—Detail Problems.

Under the caption "General Problems" will be discussed the broader phases of marine terminal development and the comprehensive planning of port improvements. Under the heading "Detail Problems" will be taken up the details of dock and warehouse design, railway trackage, and freight-handling equipment.

Part I—General Problems

Each port in many ways is in a class by itself, but broadly there are two types, as follows:

(A) Trans-shipping ports: That is a terminal where heavy and bulk commodities are trans-shipped, but where little general commercial and industrial business is carried on.

(B) Commercial and industrial ports: That is a terminal which is a general distributing and industrial center as well as one in which a purely trans-shipping business is conducted.

As a matter of fact, there are ports which range all the way between these two types, but the really great ports —that is, the large lake and seacoast cities, fall under type "B".

The problems connected with the development of a purely trans-shipping port are quite simple, as compared with those encountered in the planning of a general commercial and industrial port. The marine terminals in the former are usually provided by the one or more railroads using the port. Such terminal units are rarely co-ordinated, nor is it generally necessary that they should be. On the other hand, a port of type "B" must be developed in accordance with a comprehensive plan in which the various districts are thoroughly co-ordinated if the greatest efficiency is to be obtained. It is primarily the problems having to do with the commercial and industrial ports that will be discussed in this paper.

Marginal or Belt Railway

The marginal or belt railway may be termed the backbone of a port system. Carrying out the analogy, the deep sea terminals would be the arms reaching out for the commerce of the world; the legs would be the local shipping and industrial facilities bearing the burden of community distribution. As a man without a backbone can make but little use of his arms and legs, so a port without a belt railway system co-ordinating all its various units must labor under a serious handicap.

Wherever the physical conditions permit, the waterfront should be skirted by a continuous marginal street and beltline railway and where not continuous, the various sections should be joined in the most practical manner. Furthermore, the belt railway should connect with the trackage serving the warehouse and industrial districts whether they are situated adjoining the waterfront or some distance back therefrom. The belt railway, its connections and lateral extensions should be accessible to all the railways reaching the city, thus insuring the welding of all the various transportation agencies including docks, warehouses, industries and railways, into one great port terminal system.

There has been some difference of opinion between public authorities and railway officials as to how this should be brought about, or as to whether or not such co-ordination of the railway terminals was desirable. I believe all engineers who are students of the problem will agree, however, that it is advantageous. As to whether it should be brought about by public authority or by arrangement among the railroads is immaterial, so long as the results are accomplished. The fact remains, however, that only where the public authorities have taken over the situation are the railway facilities along the waterfront properly co-ordinated, as at San Francisco, New Orleans and Montreal. Seattle is an exception to this rule, as physically it has a splendid belt line system owned by the railroads, the principal fault being that the operation is somewhat disjointed.

The main difficulty in the way of proper co-ordination of the trackage facilities by the railway companies themselves lies in the fact that the older and better established roads dislike to give up such advantages as they may have gained, as a result of their pioneering. From the railway companies' standpoint, their view is a perfectly natural and sound one, and as a matter of common equity they should be compensated in some manner for what they would have to sacrifice in the readjustment necessary to the desired results.

Not Economical

From the standpoint of the port or municipality, however, a unified system is economically correct and in the long run I believe would prove so even to the roads apparently forced to sacrifice some of their advantages in the first instance. The avoidance of unnecessary duplication of trackage, for instance, would result in a distinct saving. The blame for failure to bring about the proper co-ordination should not be placed altogether on the railway officials as the radical and hostile stand frequently taken by municipal authorities often makes co-operation by the railroads impossible. As a matter of fact, the common interest is such, that the problems should be approached in a friendly spirit of mutual helpfulness. Practical co-operation in such a spirit would undoubtedly result in most cases in the solution of the problems without resorting to public ownership and operation of terminal railways. In case of failure to get together, however, the

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

indications are that the inevitable result will be public-owned belt lines, in the more progressive ports.

The marginal railway being established, then upon it, the backbone of the port system, can be built up the various terminal units.

A study of the situation will develop the fact that certain portions of the waterfront are particularly adapted or so situated that they should be used as follows:

(a) City business (local or coastwise shipping).

(b) Deep-sea terminals.

(c) Industrial waterfront.

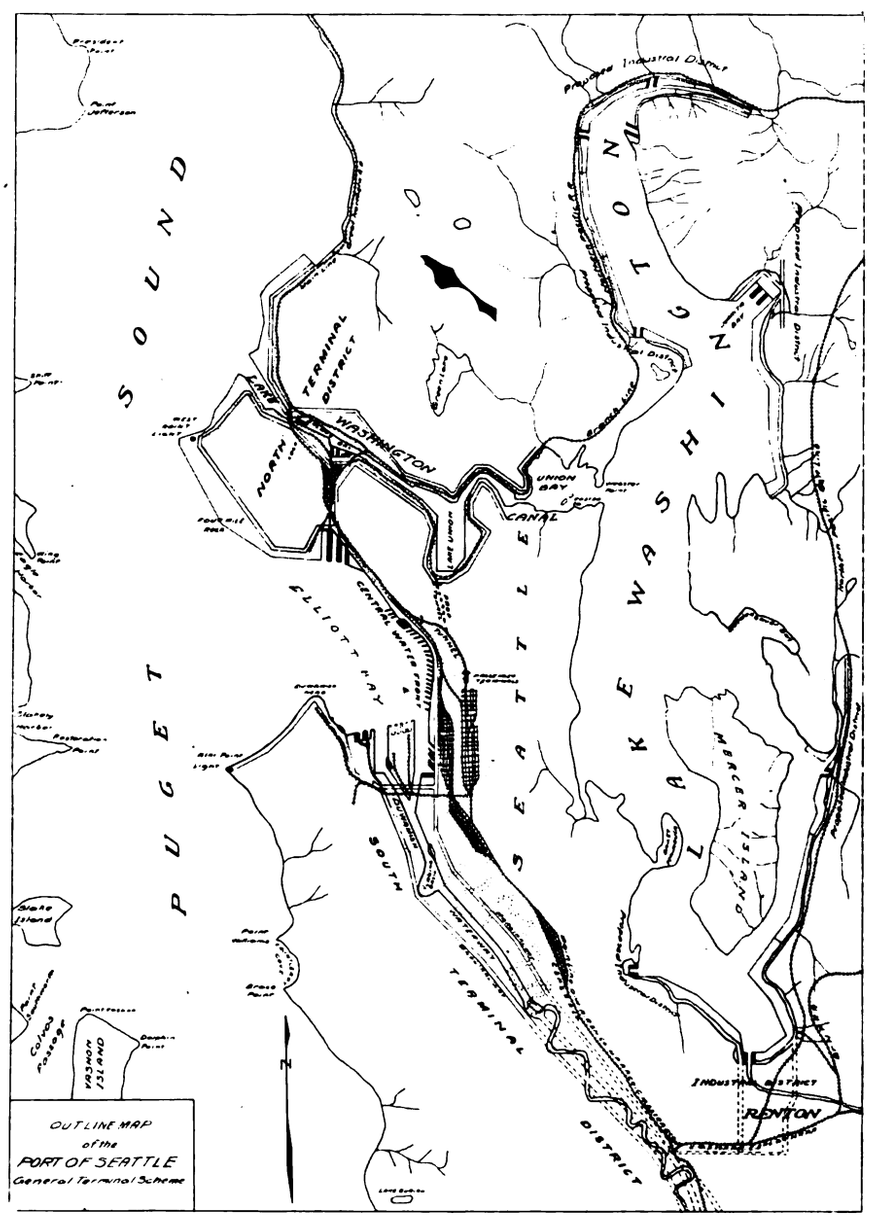
(a) City business. The local and coastwise shipping which is usually closely connected with the retail and local jobbing business of the port should be concentrated as nearly as practicable in front of the business center of the city. Usually it is not feasible nor is it desirable to have extensive railway facilities in connection with docks designed for such purposes. A marginal street along the waterfront is of great importance, however, and in connection therewith it is advantageous that sufficient belt line trackage be provided to insure rail service to the docks and warehouses wherever the need arises. Unless grade separation is feasible it usually is necessary to restrict the switching in such a district to certain specified hours.

An important phase of local traffic, which may be termed water cartage, usually develops in ports having extensive water frontage and outlying waterways. In the effort to properly equip the port to take care of the larger shipping the needs of these local carriers frequently are overlooked, resulting in unnecessary congestion, and cost of local distribution. Not only should specially designed facilities be prepared to accommodate the water cartage service at the city terminals, in front of the business district, but sub-distributing and collecting facilities for such carriers should be located at various advantageous points about the port, particularly in the industrial district, and to a certain extent in connection with the deep-sea terminals.

(b) Deep-sea terminals. The shipping facilities designed to accommodate the large freight carriers need not be located adjacent to the business center of the city. In fact, it is better that they be located elsewhere for the reason that such terminals should be conveniently situated with reference to ample railway yards and trackage facilities. It is also desirable in ports of the first magnitude to have back of the dock frontage extensive areas suitable for warehouse and intensified industrial purposes.

In the larger ports several terminal units are the natural development. These should be compact, yet comprehensive, so that in connection with a series of docks or piers there will be ample railway trackage and warehouses, grain elevators and all other facilities necessary to make a complete and well-rounded shipping unit. Thus it will be possible without shifting berth, for a ship to receive or discharge passengers, general merchandise and grain and other bulk commodities and goods requiring ordinary and cold storage warehousing.

(c) Industrial waterfront. It may sound rather odd to speak of an "Industrial Terminal", but as a matter of fact, the industrial districts should be considered in the general port terminal scheme. It is just as important that the industrial areas be intelligently platted, with a view to transportation efficiency as it is to properly plan the dock and warehouse layouts. What may be termed intensified industries frequently can be located adjacent to deep-sea terminals with particular advantage. The industries requiring water frontage or large ground areas usually seek cheaper locations, more remote from the commercial center of the city. The shoaler waters of the port are adapted to such purposes providing sufficient depth of water is obtained to accommodate small vessels, harbor boats and lighters. Generally speaking, the major portion of such water frontage should be left to development by private industries, requiring direct access to the waterfront. A sufficient number of public wharves and landings should be reserved, however, in order to in-



OUTLINE MAP OF THE PORT OF SEATTLE

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

sure to those industries located back of the waterfront the privileges of water transportation with the minimum drayage haul.

Usually the needs of vehicle traffic are anticipated in connection with the platting of industrial property. Later, spur tracks are worked in any old way, the final result being a hodge-podge mess with much wasted property. As a matter of fact, it is, if anything, more important that the railway service scheme be systematically laid out than that the vehicle thoroughfares be platted beforehand. In the beginning each industrial district should be so studied and planned that every lot and parcel of ground may be served to the best advantage, with railway trackage, such trackage to be connected with the general belt railway system.

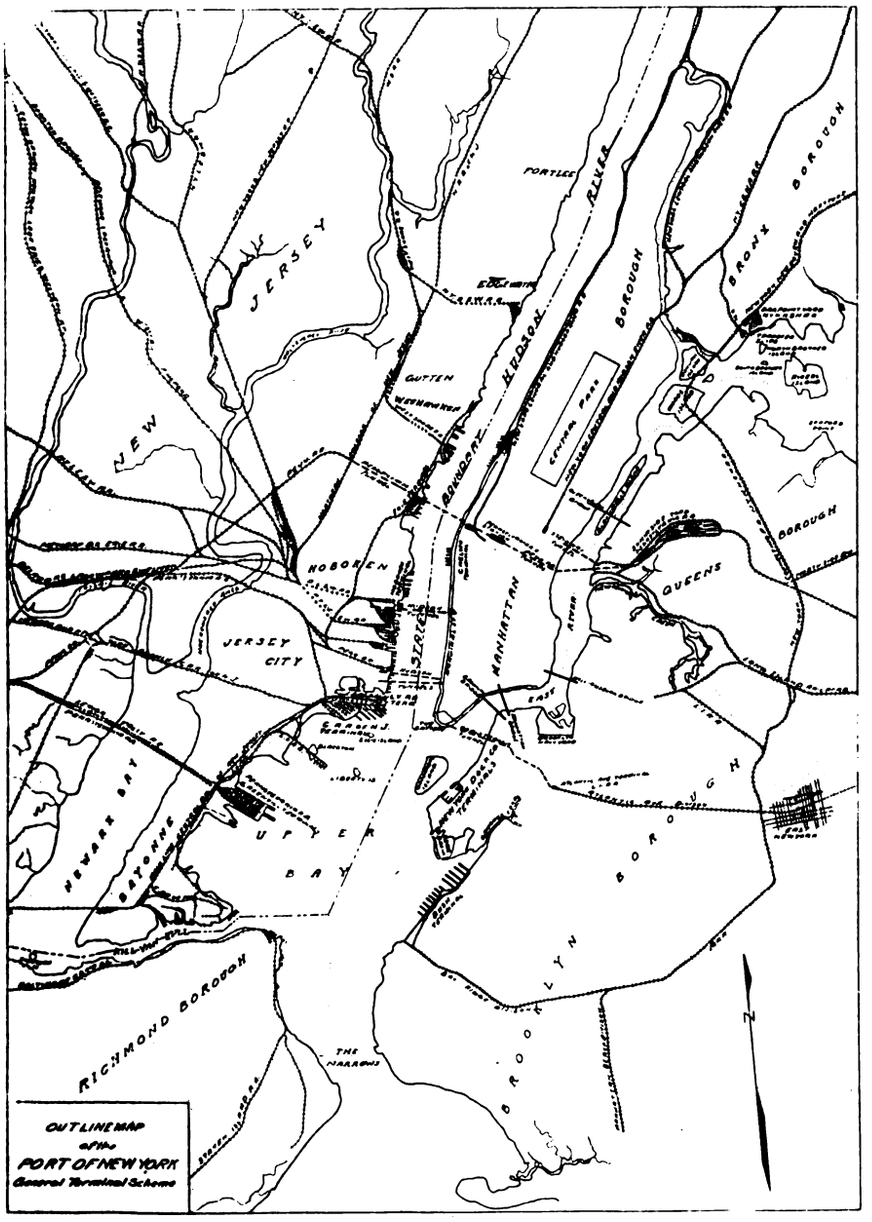
So much for the general principles governing port terminal development. Now for examples or illustrations of what has been accomplished in actual practice. On account of the limited space three ports only will be described, to-wit:

(1) New York (Atlantic coast).
(2) Seattle (Pacific coast).
(3) Buffalo (Great Lakes).

It possibly would be of interest to include several foreign ports in the list but the conditions surrounding their development are quite different and besides the available space will not permit.

(1)—*Port of New York*

New York, measured by the volume of business and many other big features, is the greatest port in the world, yet to the trained eye there is something lacking. What this is becomes apparent from a study of the general outline plan of the port. The backbone of the terminal scheme, that is, the marginal streets and railways connecting the various units, have not been fully developed. Those in charge of port affairs, however, are aware of this defect and are putting forth efforts to connect up the various disconnected sections of the backbone. They are handicapped by the fact that the harbor is cut into longitudinally by the interstate line drawn through the upper bay and along the Hudson river. Geographically and commercially, the port is one, but politically it is separated into halves. There is promise, however, that this difficulty will be overcome, in a measure, as a result of the formation of a New Jersey harbor board and the promised close co-operation between it and the department of docks and ferries having jurisdiction over the New York side.



OUTLINE MAP OF THE PORT OF NEW YORK

The city business, that is the passenger, package freight and local shipping is logically centered about Manhattan island. The passenger and express business is really national in its scope, however, on account of New York being the American terminus of the great trans-Atlantic ferry service. A large proportion of New York's waterfront is utilized for purely local traffic, that is what might be called a water-cartage business carried on in car ferries, lighters and harbor boats of all descriptions. The East river, Harlem and the shoal portions of the Jersey shore are practically all given over to local and industrial business. Even on the North river side of Manhattan island, the terminal frontage required for the local transfer of freights is so extensive that it is difficult to make room for the facilities necessary to keep pace with the growing trans-Atlantic passenger and express business.

Deep-Sea Cargo Terminals

Logically, a preponderance of the terminal facilities to take care of the trans-shipping and heavy cargo business should be located on the Jersey shore where the railroads are situated. To a certain extent this has been done, but apparently full advantage of the situation has not been taken. Tentative plans, however, have been prepared for the Jersey harbor board, proposing to reclaim the shallow areas on the upper bay, by dredging and filling, thus creating terminals on a larger scale than heretofore attempted.

On the Brooklyn shore of the upper bay the most extensive trans-shipping and storage terminal development has

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

taken place, in spite of the fact that rail service has been dependent on car ferries. The extensions of the Pennsylvania and N. Y., N. H. & H. trackage to Long Island, together with contemplated extensions and belt line tracks is greatly improving the situation.

To further develop this district it is proposed to co-ordinate the terminal systems of the dock department, New York Dock Co., and the Bush people, between the Bayridge terminal and the Brooklyn bridge, by the construction of a marginal street and railway along that section of the waterfront. The enormous cost of bringing this about at this late day should be an object lesson to newer communities having the opportunity to plan broadly and correctly before the building up of the property makes it difficult if not impracticable of accomplishment.

Industrial Waterfront

Many miles of the harbor front are occupied by industrial establishments, but as a general thing there is little systematic development for such purposes. The most notable instance of scientific industrial planning is at the Bush terminal, and to some extent on the property of the New York Dock Co.

The evident shortcomings of the hit-or-miss industrial growth has aroused the port authorities and others interested to the need of providing well-laid-out industrial waterfront property.

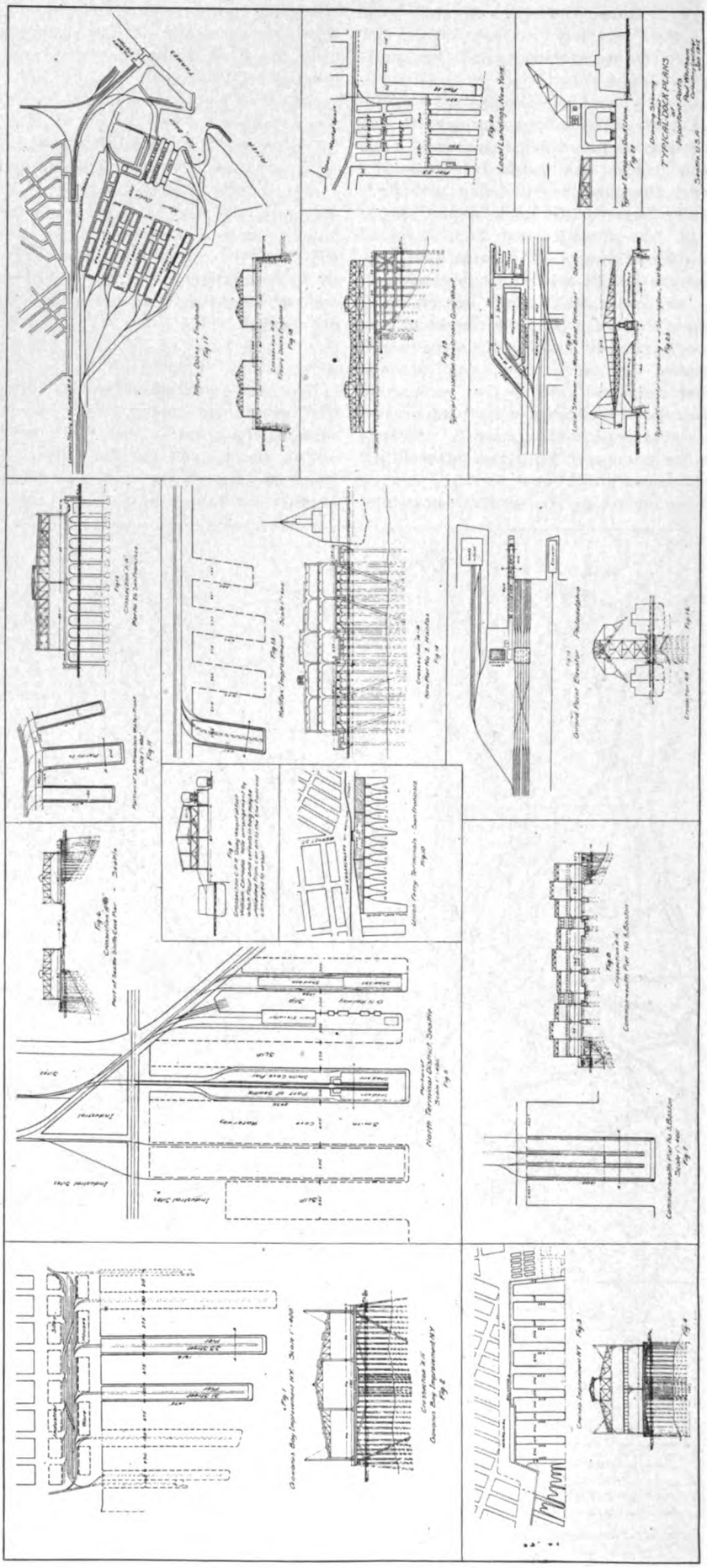
The Jamaica bay project now apparently on the way to accomplishment is the outgrowth of this awakened interest. On the Jersey side the new harbor board as well as private concerns have prepared tentative plans for industrial districts laid out with a view to transportation efficiency and economy.

Some of the noteworthy features in regard to the port of New York may be summarized as follows:

(1) The failure, in earlier days, to have prepared and followed up a comprehensive scheme of port development is resulting in much inconvenience and loss more apparent in New York than elsewhere on account of the magnitude of its commerce.

(2) Herculian efforts are now being made to straighten things out and properly co-ordinate the harbor system with the project that the efficiency of the port will be greatly improved during the next few years.

(3) There are a number of splendid terminal units in the port which forcibly illustrate the advantage of grouping docks and warehouses in



DRAWING SHOWING TYPICAL DOCK PLANS OF VARIOUS PORTS

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

close administrative and operating units.

(4) There is a tendency, as elsewhere, to look after the big shipping and let the local business take care of itself. This is a mistake, as evidenced by the unnecessary congestion and waste effort that has been the result in New York.

(5) New York is a special condition, consequently many of the detailed solutions of its problems cannot be applied elsewhere, but as to the fundamentals of port planning, there is much worthy of emulation, as well as object lessons of what not to do.

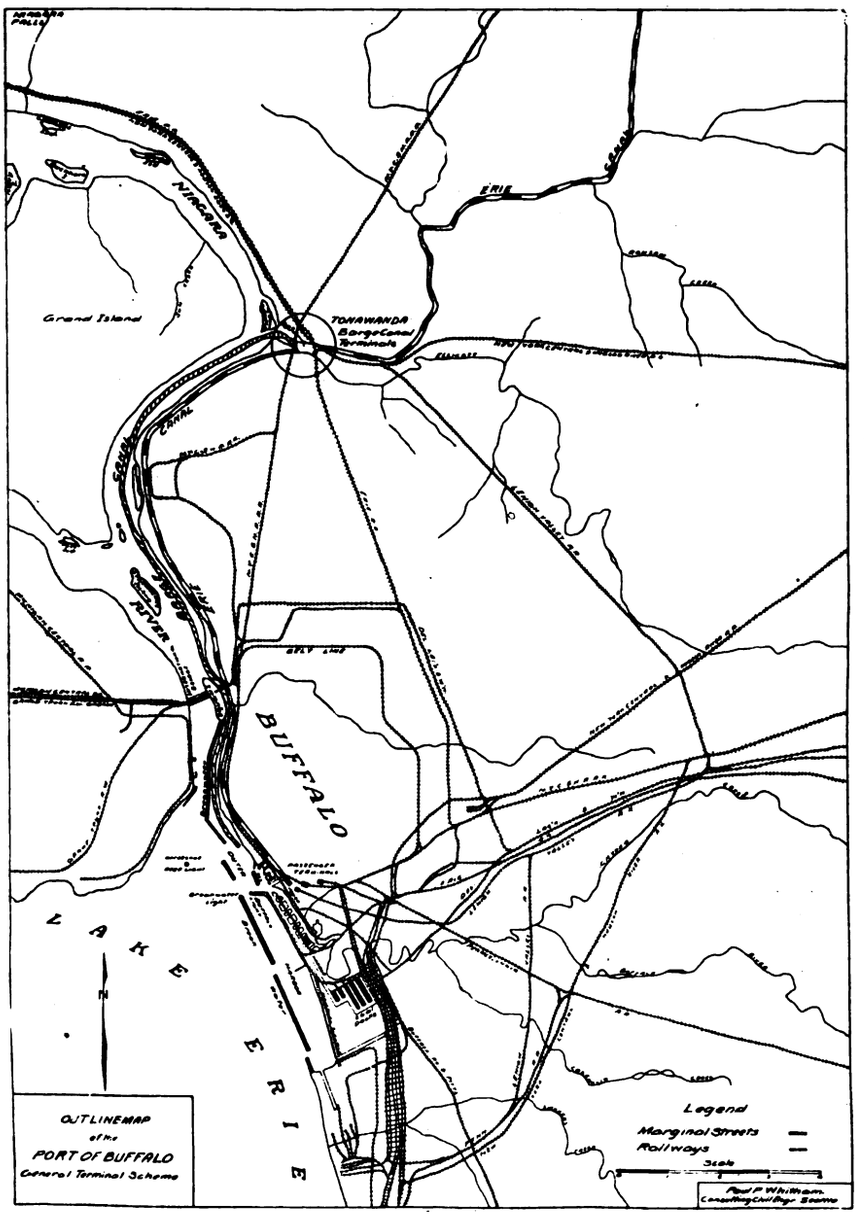
(II)—*Port of Seattle*

Across the continent from New York is a port, young in its development, but potentially in the same class with New York. Seattle, like New York, has an extensive shore line, the main section of the city being practically an island or will be so upon the completion next year, of the Lake Washington canal.

Realizing the advantages that will result in the development of the port in accordance with a comprehensive plant, about three years ago the services of Virgil G. Bogue, of New York, were obtained in connection with the preparation of a general plan of development. In this plan particular attention was given to the port terminal facilities. The comprehensive scheme then laid out has been used as the basis for the improvements subsequently made by the port of Seattle commission, and other public authorities.

The local and coastwise shipping facilities are located in the central waterfront district, a shoreline of approximately 3 miles in front of the business section. A wide marginal street parallels the waterfront and on it are located common-user railway tracks giving service to all the piers.

Lake Union, on the line of the Lake Washington canal, situated as it is in the very heart of the city, is destined to become the city terminus of large water-cartage business as a result of the construction of the canal. The local situation at Seattle, together with the fact that the protected waters of Puget sound have some 2,000 miles of shore line, is an invitation to the growth of this class of business on a scale more nearly as it has developed at New York than at any other American port. In proportion to the entire business of the port, it is now large.



OUTLINE MAP OF THE PORT OF BUFFALO

Deep Sea Terminals

There are two districts which naturally lend themselves to the development of large over-seas shipping terminals, on account of the topographic advantages and the proximity of railway yards and tracks, namely, the North Terminal District and the South Terminal District, respectively, at the north and south ends of Elliott bay.

The North Terminal District includes a frontage on Salmon bay which upon the completion, this year, of the government lock, will become a fresh water non-tidal basin about the size of the combined Royal Victoria and Albert dock basins of London. Between Elliott bay and Salmon bay is a valley or low strip of land, almost ideally situated for railway purposes. The streets are naturally extended across the draw as viaducts, thus eliminating grade crossings. The switching is an end-on movement from the yards to the docks at either end.

The South Terminal District includes what was formerly mud flats where the Duwamish river debauches into Elliott bay. Using the material from the excavation of two 1,000-foot waterways, approximately a mile in length each, these flats have been largely reclaimed by filling. Several thousand acres are consequently available and being made use of for railroad, industrial and dock purposes. To the southward in the level valley, the railroads have located their classification yards. From these yards the car movement is end-on to the warehouses and docks.

The extensive level areas in the valley lying southward from Elliott bay offer the largest opportunity for industrial growth. To take full advantage of the situation the naturally crooked stream of the Duwamish is

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

being straightened and deepened for a distance of 5 miles inland by the construction of a 500-foot waterway. On each side of the waterway, from 1,000 to 1,500 feet distant from it, marginal streets are being constructed, on which will be located belt-line switching tracks. Between the marginal streets and the waterway industries are being located in a systematic manner, where they will have the benefit of both water and rail transportation facilities.

Ultimately these waterways and the marginal streets will be extended to a point west of Renton. At Renton there is a large level industrial district with frontage on the south end of Lake Washington.

About the shore of Lake Washington are a number of low-lying districts well suited to industrial purposes. These are to be served with marginal streets and railway tracks. The industries along both sides of Lake Washington canal are served by marginal streets and railway tracks.

The plan of Seattle, much of which is already assured, calls for the thorough co-ordination of the water and rail transportation facilities along the waterfront and in all the industrial districts. More than any other one party, A. L. Valentine, superintendent of public utilities, is responsible for a spirit of co-operation between the transportation companies and the public authorities, that is getting results, and will, if continued, make Seattle the best laid-out terminal in this country.

III—Port of Buffalo

Port terminal engineers have been prone to overlook the Great Lakes in their search for helpful information, while, as a matter of fact, some of the greatest ports of the world are located on the Great Lakes. One reason may be that the shipping and harbor conditions on the lakes are quite different from those encountered at the sea-coast ports. There are, however, certain underlying principles essential in the economic development of terminals that will apply to both lake and coast ports. Much may be found at the leading lake ports such as Buffalo, Cleveland, Chicago, Milwaukee and Duluth that will furnish good subject matter to those interested in the general problems of port and terminal development.

The writer has chosen to describe the port of Buffalo, not, perhaps, that Cleveland or Duluth or other places are not of equal interest, but for the simple reason that he is more familiar with Buffalo.

The shipping business at Buffalo is diversified, to a greater extent, perhaps, than some of the other leading lake ports, on account of the fact that it is the easterly terminus of the large vessels operating on the lakes and is the westerly terminus for the Erie canal, now being converted into a barge canal.

Like most of the lake ports the harbor at Buffalo is a combination of artificial enclosure, formed by breakwaters, and a river channel dredged and straightened to meet the demands of commerce.

Port of Buffalo

The port terminal facilities at Buffalo, as in most of the ports of this country "just grew", with the consequent result that the general arrangement of the facilities falls materially short of what they should have been if constructed in conformity with a pre-determined comprehensive scheme.

The barge canal commission, the municipal authorities and some of the public organizations of Buffalo are now alive to the need of better planning for the future. It has been proposed that the municipality acquire the waterfront on the outer harbor, a portion of which is already served by the belt-line connecting with the various railway systems centering at Buffalo. This system may be readily extended along the Hamburg turnpike, thus giving to the outer harbor a backbone for its future improvement, making possible the construction of well-co-ordinated shipping facilities.

Most of the existing facilities are located on the river and city channels which compose what may be termed the inner harbor. In this inner harbor are located the general freight and passenger docks and local landings as well as facilities for handling bulk and heavy cargoes.

At the entrance to the inner harbor the barge canal commission now have arranged to construct the first unit of the new barge terminals, which will be a great improvement over the existing facilities. The city has already acquired 4,000 feet of water frontage facing the outer harbor and situated northerly from the entrance of the inner harbor.

Between Buffalo and Tonawanda the Erie canal has been enlarged into a shipping channel and new locks built to overcome the rapids and to accommodate vessels up to 70 x 700 feet. This will make the slack water district in the vicinity of Tonawanda about Grand island available for shipping and particularly for industrial waterfront purposes, the useful frontage of which is estimated to be between 50 and 60 miles. Apparently it is still practicable to co-ordinate the various existing and proposed terminal and industrial sections of Buffalo, thus developing a well-systematized port terminal.

In conclusion, it may be well to emphasize some of the principal points. These points may be summarized as follows:

(1) The backbone of a port system is the belt-line railway combined with the marginal street.

(2) The deep-sea terminals are the arms of the port, reaching out for the commerce of the world.

(3) The local shipping and industrial facilities are the legs of the port, carrying the burden of community shipping.

(4) A man without a backbone can make little use of his arms and legs, likewise a port without a belt railway system co-ordinating all its various units must labor under a serious handicap.

(5) It is necessary that the general terminal scheme be worked out before the details—that is, the docks, warehouses and other structural units, can be properly located and designed.

The United States is now entering upon an era of development in which organization and efficiency are to play a more important part than they have in the past. The port that does not take stock of itself and plan broadly in the future will find itself laboring heavily against rival ports organized along the lines that spell terminal efficiency.

Part II—Detail Problems

Preliminary. When speaking of port terminals people usually think of docks, wharves and their equipment. In Part I, which dealt with the general problems of port terminal development, it was pointed out that the docks, wharves and warehouses are detail problems which cannot be worked out to the best advantage until after the fundamental plant of the whole terminal scheme has been determined upon. An error in the design of a pier affects the efficiency of that particular dock, but an error in the general layout of a terminal adversely affects the efficiency of all the piers and warehouses. Furthermore, a terminal unit including a group of piers and warehouses, if located without due regard to the general arrangement and terminal efficiency of the port as a whole will fall short in its practical utility no matter how well it may be designed in detail.

The "Detail Problems" may be

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

grouped naturally under two general heads, as follows:

(A) Grouping and Design of Structures.

(B) Equipment.

It is proposed in this paper to discuss some of the general principles of design, and to illustrate the same by giving a number of examples of what has been done in actual practice.

(A)—Grouping and Design of Structures

Before attempting the design of a terminal unit or individual dock it is of course necessary to understand the class of business and type of shipping which is to be taken care of. Local conditions affect the detail designs to such an extent that few general rules can be applied, but there are certain broad classifications which can be made as follows:

(a) Docks and landings for local traffic.

(b) Docks and warehouses for overseas trade.

(c) Wharves and landings serving industrial districts.

Under these three heads the designing problems will be discussed in connection with descriptions and illustrations of actual improvements.

(a)—Docks and Landings for Local Traffic

Local traffic may be interpreted as including water cartage, lighterage and general freight and passenger business borne in harbor, local coastwise vessels and ferry boats.

The landings for this traffic vary all the way from small floats and open piers for motor boats and barges to big ferry terminals and large piers elaborately equipped to handle passenger and package freight business.

Landings for motor boats and lighters. (See Figs. 10, 20 and 21.) Fig. 10 shows a general plan of the Union Ferry Terminal at San Francisco. Adjoining Slip 10 a wharf has been erected, one side of which is designed for the use of small vessels, motor boats, etc. The tidal range at San Francisco bay being only a few feet, as it is also at New York (see Fig. 20), ordinary wharves answer for the purposes of small boats very well. At Seattle, however (see Fig. 21), where there is a maximum tidal range of 17 feet, it is necessary to provide floats for the small boats. The floats shown in the last-named drawing are made available at all stages of the tide, by means of a gangway and by an elevator which connects them with the upper deck of the shed at any stage of the tide.

Landings for ferry boats and local freight passenger steamers (see Figs. 10, 20 and 21).

Fig. 10 shows a general plan of the Union Ferry landings at San Francisco which is the largest ferry terminal unit in this country. Fig. 21 illustrates the general plan of a local landing at Seattle which is especially equipped with a marine elevator slip, that makes it possible to unload small side-port steamers at any stage of the tide, and to truck the commodities directly to and from either the first or second floor of the shed.

The Chelsea piers (see Fig. 3) might also be classed as a city landing, although they are used as the terminus of the trans-Atlantic ferries, doing a special passenger and package freight business.

(b)—Docks and Warehouses for Over-Seas Trade

Within the past few years many of the existing piers and docks have proven inadequate on account of the great increase in the size of deep-sea vessels and because of the pressure for greater economy in the handling of cargo. In the older ports many of the docks were erected before the importance of railway service on piers was appreciated. Some of the piers are too short and narrow and frequently the slips are not of sufficient width. Outside of New York practically all of the new piers are equipped with railway tracks and in New York an effort is being made to provide trackage at certain terminals.

The general trend in pier and wharf design can be presented most clearly by illustrating and describing typical structures built within recent years.

Fig. 1 shows the general arrangement of the new Gowanus bay improvement on the Brooklyn shore adjacent to the Bush terminals, two piers in which have recently been put into service by the department of docks and ferries. These piers are supported on timber piles, topped with a concrete decking. The superstructures are of steel-truss and frame construction. These are said to be the largest piers in New York harbor.

Fig. 5, drawn to the same scale, shows the existing and suggested improvements in a portion of the North Terminal District at Seattle. The largest pier is that recently constructed by the port of Seattle commission. The completed portion is approximately 1,800 feet long, and so arranged that if the demands require it may be finally extended the full length of 2,430 feet. It is the filled-core type of construction, with a creosoted pile wharf structure on each side, supporting a timber frame and corrugated iron-sided sheds at the outer end. (See Fig. 6.) The inner portion of the pier is open construction, and is equipped with locomotive and gantry crane for handling machinery, rails and lumber.

Adjoining this pier is the Great Northern railway's slip with a long transfer shed and dock on one side and grain elevator on the other. These docks are also of creosoted piling wharf and timber shed construction.

You will note by referring to Fig. 2 and 6 that there is a marked difference in the prevailing practice on the Pacific coast from that generally adhered to in New York and a number of other Atlantic coast ports, that is—while at New York there is a narrow apron 4 or 5 feet in width on the outside of the sheds, the Pacific coast docks are usually constructed with an apron varying from 15 to 30 feet in width, supporting from one to two railway tracks.

At the New York pier (Fig. 2) the proposed railway tracks are to be located inside of the shed along the center line, but are flush with the wharf deck. In Fig. 6 the tracks in the rear of the sheds are depressed, bringing the car floors level with the wharf deck.

Chelsea Piers at New York

Figs. 3 and 4, which show a general plan and typical cross-sections of the Chelsea piers at New York, may be classified under this head, and are primarily designed as the city terminus of the big trans-Atlantic passenger and express steamers. They are supported on timber piling, carrying two-story steel truss and frame sheds.

The Commonwealth pier at Boston (see Figs. 7 and 8) is rather unique in its shed arrangement, as is particularly indicated in the cross-section. This pier is also of the filled-core type with overhanging wharves on each side. In this case the wharves are supported on timber piling and with a concrete slab decking. The shed is of steel truss and frame construction, two stories in height. There is a transfer shed on each side and a central shed designed principally for storage purposes.

There are two depressed tracks located between each shed and the central storage warehouse which, with the single track on each wharf apron, gives ample railway service. This pier also serves the purpose of a waterfront depot where trans-Atlantic passenger steamers are taken care of. The land end of the upper floor is fitted with elaborate passenger accommodations and is connected with the city by an overhead viaduct. There

Generated on 2024-07-26 09:47 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

are also elaborate facilities for taking care of the immigration and customs inspection.

Pier 26 at San Francisco (Figs. 11 and 12) is a concrete fireproof type of construction with steel truss and frame shed. The wharf is supported on concrete cylinders. It will be noted that there is a track on each apron, one of them being depressed to bring the car floor level with the wharf deck. A large number of San Francisco piers are built on concrete cylinders or piles, but a number of new piers now under construction are being erected on creosoted piling.

At Halifax the Canadian government is undertaking extensive shore improvements (see Figs. 13 and 14). The completed pier is supported on concrete piling with reinforced concrete deck and shed. It will be noted that the pier is well served with railway tracks, there being one on each apron and two tracks through the center of the shed, all four tracks being depressed to bring the car floor level with the shed floor.

In Fig. 14, at New Orleans, the wharves are of the quay type of construction, the new ones being of the general type as shown in Sec. (see Fig. 19). The wharf overhanging the slope of the river bank is supported on creosoted piling. The sheds are of the steel-frame truss construction. In most instances railway tracks are located on marginal streets, immediately back of the sheds.

The Tilbury docks in London are typical of the enclosed basin type of construction prevalent in Great Britain and some parts of Europe. The Tilbury docks are better in their general arrangement than most of the older construction, found in London and other English ports (Figs. 17 and 18).

Design and Arrangement of Docks

On account of the excessive tidal range, with a maximum of approximately 22 feet, the engineers in charge of the construction of these docks deemed it advisable to create a basin separated from the river by a lock which maintains the water within the basin at substantially a uniform level. It will be noted that graving docks are located parallel with the lock entrance in such a position that vessels may enter from either end, which appears to be a particularly advantageous arrangement, under the circumstances.

These docks are situated about 22 miles below London bridge, and are particularly used by the larger steamers operating from London. They are especially well provided with railway trackage.

Fig. 15 illustrates a terminal improvement designed especially for the purpose of shipping grain in bulk. You will note that the concrete grain elevators are located on the ground back of the waterfront, the grain being carried by belt out on the narrow pier, from which it is discharged by means of chutes into the vessels. (See cross-section Fig. 16.) The grain elevator in this terminal is not planned so much as a storage warehouse, but rather as a mechanical means to transfer grain from rail to ship, consequently there is an unusually ample railway yardage, and a proportionately large number of receiving pits, making the grain-handling capacity much greater than is usually provided.

Fig. 20 illustrates another special dock which might possibly be classified as industrial in its character, designed to handle and store coal at West Superior. This is rather typical of practice on the Great Lakes, where the handling of bulk cargoes is developed to a high degree of perfection.

(c)—Wharves and Landings Serving Industrial Districts

Naturally there is less uniformity of type and character of structure in connection with industrial development than is found in commercial docks largely for the reason that they are designed to meet the particular needs of the industries they serve. Such wharves in many cases are simply uncovered landing platforms while others are elaborate affairs equipped with mechanical handling devices. Industrial wharves intended as public landings usually may be of simple construction. The shed space need not be large as the class of commodities handled are generally of a character that a limited exposure to the weather will not harm them. Some economical type of derrick or crane should be provided to assist the unloading of scows or lighters not so equipped.

Timber-Concrete. As will be noted from the illustrations given, docks are constructed of timber, concrete and steel, and in some instances various combinations of those materials. In recent years quite a spirited discussion in regard to the relative advantages of temporary (timber construction) and so-called permanent (concrete construction) has taken place among engineers. As a matter of fact, local conditions and financial conditions play an important part in determining what should be done in each particular case. For instance, on the Great Lakes, where wood borers and tidal variations do not have to be taken into account, it is practical to erect concrete structures on timber piling cut off at or just below the water line. At sea-water ports infested with wood borers, untreated piling, except for the most temporary of structures, is out of the question. On the other hand, particularly where the tidal range is considerable, the cost of using concrete in deep water is very expensive. As a result, creosoted piling has come into use at many ports, both on the Atlantic and Pacific.

At San Francisco, where a number of concrete piers have been erected, the harbor board is now using creosoted piling in a number of its new piers, for the reason that they can be erected at less than half the cost of concrete. At Seattle, the port authorities have built all their wharves and piers on creosoted piling, figuring that a life of 20 to 25 years can thus be obtained and that as a matter of fact, 25 years is about the limit of the commercial life of a dock. The development in transportation is so rapid that a pier is usually out of date in that length of time, so that it is a distinct advantage if the cost of the structure is low enough to permit of its renewal along lines to fit the changed conditions.

New York is bothered very little with wood borers, and for that reason timber piling is used almost exclusively. In some cases concrete slab decks are placed thereon. Piers constructed 25 and 30 years ago it is now necessary to replace with new structures, designed to meet the changed requirements of shipping. If these had been of concrete construction, the burden of the heavy first cost coupled with the high cost of removing them, would undoubtedly have resulted in delayed reconstruction, much to the detriment of the port.

Filled-Core Piers

A type of pier which of late has come into favor where conditions make its adoption practicable is the double-width filled-core pier, similar to the Smith's Cove pier, Seattle. (See Fig. 6.) This is in effect two quay wharves, placed back to back, and has the advantage of permitting good trackage arrangements in the rear of the sheds. There is also the advantage resulting from the fact that there is no conflict of cargoes being worked from vessels on opposite sides of the pier.

The tendency, brought about as a result of experience and the increased size of vessels, is to provide for greater slip width. Where formerly between 100 and 200 feet was consid-

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ered sufficient, between 200 and 300 feet or up to 350 feet is found desirable, even where comparatively small boats are accommodated. In a number of instances, where slip space has been sacrificed to get more wharf or land area, the resulting congestion in the slips has so curtailed the capacity of the improvements that the large wharf area proved unprofitable. The proper proportioning of slip and wharf area is one requiring most careful consideration if the maximum efficiency is to be obtained.

The congestion of business in pier sheds frequently is the direct result of a mistaken conception of the use of such a shed. As a general rule the best results are obtained by confining the dock sheds to transit purposes only. Goods requiring storage for more than a very few days should be moved to warehouses designed for that purpose. On this account, it will be found advantageous, frequently, to provide concrete warehouses in connection with the piers of the terminal group. In such a manner the capacity of the pier shed may be increased materially and goods in storage are placed where better insurance rates are obtainable.

(B)—Mechanical Freight-Handling Equipment

In Europe it is customary to equip the docks with large gantry cranes similar to Fig. 22. In the United States, while there has been a good deal of discussion in regard to the merits and demerits of the European system, still, as a matter of fact, such cranes are not in use, except in especial docks designed to handle bulk and particularly heavy commodities.

It seems difficult to ascertain the reason why such cranes are deemed necessary in Europe and not in this country. I understand that in New York, when piers were being constructed for the use of trans-Atlantic steamship companies, the operators who use these cranes at their European terminals were given the opportunity to have such equipment provided at their New York terminals, but refused. At San Francisco and Seattle, docks recently constructed have been designed so that cranes might be installed if desired by the companies using the docks. So far they have refused to install such equipment, preferring the use of the ship's tackle.

At New York and some other Atlantic ports (see Figs. 2 and 4) what are known as cargo masts have been erected on the sheds. These are worked in connection with the ship's tackle and are particularly of assistance where it is necessary to swing the cargo direct through the doors of the shed. Municipal dock No. 1 at Portland, Ore., recently completed, has been equipped in the same manner.

In the past few years, port engineers have been giving a great deal of thought to the matter of cheapening the cost of handling cargoes at docks. In some instances overhead mono-rail systems have been installed, but I understand they have not proven particularly successful.

The use of the electric trucks, specially designed for dock purposes, in several instances, is proving quite successful. The indications are that there will be considerable development along this line especially where goods have to be trucked a distance of several hundred feet. In sheds of two or more stories in height spiral chutes, various lifts and osculators are in some cases proving quite efficient. The problems of mechanically handling miscellaneous package freight is yet unsolved, although progress is being made and with the thought and attention being given the subject, undoubtedly devices will be developed which will reduce considerably the now excessive cost of handling freight at terminals.

The details of port equipment, that is, the piers, sheds, warehouses and freight-handling devices, are very important factors in the handling of commodities, so much so that their efficiency or lack of it has an appreciable effect on the cost of living.

Like in other matters, there is a tendency to fall into ruts and do things, because they have been done that way before, regardless of changing conditions, or the particular requirements of each new situation.

An open-minded study of what has been done any place and everywhere, followed up by an intelligent application of suggestions thus obtained to the particular problem at hand will mean development of the much-needed greater efficiency in port terminal facilities, in the near future.

Obituary

August Mietz, of the firm of Mietz & Weiss, manufacturers of oil engines, New York, died recently at the age of 80 years. Mr. Dietz was a native of Germany but came to this country at the age of 21. He was the founder of the Mietz & Weiss company about 15 years ago.

George Lawley, the veteran boat builder, died at his home in South Boston, Mass., on Feb. 28 at the advanced age of 92 years. He had been in excellent health up to within two weeks of his death when a cold developed into pneumonia. Mr. Lawley was born in London, England, Feb. 13, 1823, and came to this country in 1851. In 1854 he engaged in ship building in East Boston but moved in 1866 to Scituate to engage in the same line of business. The Lawleys settled in South Boston in 1874 and have been in business continuously in that place since. The firm built the Puritan which defended the American cup in 1885 and the Mayflower which defended it the following year. Among the big yachts built by the firm were the Alcaea, the Ingomar, the schooners Letona and Endymion, and the steam yachts Aquilo, Courier, Inca, Varuna and Valda. They also built the torpedo boat Blakely and Delong for the United States government.

The oil fuel navy tank ship Maumee, building at the Mare Island navy yard, will be equipped with one 50 horsepower, two-cylinder, direct-connected electric set furnished by the Bolinders Co., 30 Church street, New York, and her propelling power will consist of two 2,500 horsepower Diesel motors. The Macon-Atlantic Navigation Co., of Macon, Ga., which is building a fleet of shallow draft, freight-carrying barges to ply between that port and Brunswick, will have each craft propelled by two 50 horsepower Bolinders direct-reversible marine oil motors, which are especially recommended for their economy and reliability in operation. The Bolinders Co. is represented by William R. Haynie, with offices at 30 Church street, New York.

The William Clifford & Sons Co., Elizabeth, N. J., are placing on the market a new fire-resisting compound called Dunbar's Resisto. It is an Australian invention and is marketed in the form of paint and putty. Tests show that it greatly preserves and protects brick and iron work where high temperatures are used and has already found its way aboard a number of steamers. On one ship where it was necessary to renew the bridge walls at the end of each voyage, the brick coated with Resisto putty and then covered with the paint lasted throughout five voyages. M. M. Drake, 17 Battery Place, New York, is the marine representative of the company.

The steamer William O'Brien was recently launched from the yard of the New York Shipbuilding Co., Camden, N. J. The new vessel will engage in the lumber trade between Atlantic and Pacific coast ports and has been especially designed for this service.

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Panama Canal Traffic

The Panama canal was opened to navigation on August 5, 1914, the steamship Ancon of the Panama Railroad Steamship Co.'s fleet making the first trip from ocean to ocean. On ordinary occasions such an event would have attracted international attention, but it passed into history without special mention, the European conflict which was then in its beginning overshadowed everything else. Since its opening, navigation through the canal has been interrupted by repeated slides in the Culebra cut, notably so at Cucaracha, but the delays have not been serious, as the dredges have been enabled to clear the channel for deep draught vessels within a couple of days. These slides at this particular point may be expected to continue until the overburden of earth has sloughed away. The backbone of the great divide is broken at this point and the great weight upon the unsupported sides of the prism causes the bottom of the canal to rise, with consequent displacement of the sides, causing slides. The matter will remedy itself as soon as the equilibrium of nature is restored.

Collections of tolls in the canal began in May last with the starting of traffic in barges towed by canal tugs, which lasted until the opening of the canal to ocean-going vessels on Aug. 15. Following is a summary of the receipts of tolls by months to Dec. 1:

Prior to August 15	$ 11,610.69
August 15 to 31	88,401.80
September 1 to 30	269,863.00
October 1 to 31	378,087.12
November 1 to 30	387,242.40
Total	$1,135,205.01

Up to Dec. 1, 257 vessels passed through the canal, of which 227 were loaded and 30 in ballast. As distributed over the principal routes on which the traffic through the canal is moving, the transits to December 1 may be summarized as follows:

	Number of Vessels.	Canal Tonnage.
Coastwise, eastbound	54	320,155
Coastwise, westbound	61	282,020
U. S. Pacific coast to Europe	34	248,020
Europe to U. S. Pacific coast	8	38,318
South America to U. S. and Europe	24	166,917
U. S. and Europe to South America	15	74,644
U. S. Atlantic coast to Far East	24	148,207
Miscellaneous routings	7	19,203
Vessels without cargo	30	.....
Total	257	1,297,484

Steamboat Inspection Rulings

The following are copies and excerpts from letters written during the month of January, 1915, wherein rulings have been handed down relative to the interpretation of certain of the revised statutes, and also sections of the rules and regulations, relating to this service.

Under date of Jan. 6, 1915, the bureau advised the Russia Cement Co., of Gloucester, Mass., that Signet marine metal polish may be transported on steamers carrying passengers, and may be used as stores on passenger or pleasure steamers.

Referring to the bureau's circular letter dated Dec. 1, 1914, on which there was published information which was given under date of Nov. 17, 1914, to Benham & Boyesen, of New York, N. Y., that chlorate of potash shall not be transported in bulk on steamers carrying passengers, and setting forth the restricted conditions under which it could be transported, you are now informed that the question having been considered by the solicitor of this department, that officer under date of Jan. 8, 1915, handed down an opinion in which he concludes that chlorate of potash, unmixed with combustible matter, can not be considered a like explosive, burning fluid, or a like dangerous article to those enumerated in section 4472 R. S., and accordingly, when properly confined in suitable containers, its transportation on passenger vessels is not prohibited.

Under date of Jan. 11, 1915, this bureau informed the Simmons Hardware Co., of Philadelphia, Pa., that roofing cement manufactured by the General Roofing Co., and by the H. W. Johns-Manville Co., samples of which were submitted for test, shall not be transported on steamers carrying passengers.

During the month of January, 1915, the following named companies submitted affidavits required by section 29, rule II, general rules and regulations, relative to valves and fittings:

Detroit Ball Valve Co., Detroit, Mich.

Reliance Steel Casting Co., Pittsburgh, Pa.

During the month of January, 1915, the following named companies submitted affidavits in regard to the manufacture of fusible plugs as required by the bureau's circular letter dated June 30, 1914:

T. Murphy Iron Works, Jacksonville, Fla.

D. T. Williams Valve Co., Cincinnati, O.

Hoffman & Billings Mfg. Co., Milwaukee, Wis.

Life Saving Service

In three important particulars the statistical record of the operations of the life-saving establishment for the last fiscal year shows larger totals than are to be found in any similar annual enumeration of results in the history of the service, namely, the number of vessels reported as having suffered accident or disaster, the number of persons on board said vessels, and the value of the property (vessels and cargoes) exposed to damage or loss.

The number of vessels involved was 1,937. These carried 9,296 persons, and were valued with their cargoes at $21,507,860. Of the persons mentioned, 38, or one in 245, perished. The number of persons actually saved was 4,762. The estimated value of the property saved was $18,783,200, of property lost $2,724,660. As regards the number of vessels involved, it should be stated that the increase over the preceding year's figures (an increase of 194) is chargeable to the record of casualties to vessels of the undocumented class, embracing small craft—gasoline launches, sailboats, etc.—of less than 5 tons burden, such as largely frequent harbors and other sheltered waters.

The number of documented vessels—of 5 tons register and upward—that suffered disaster during the year within the scope of the service was actually smaller than the number so reported during 1913, being 522 as against 552 for the year last named. These 522 documented vessels carried a total of 5,539 persons—of whom 26 were lost—and were valued with their cargoes at $20,368,330, nearly $6,000,000 more than the total value of 552 vessels of the same class similarly jeopardized in 1913. They suffered loss to the amount of $2,654,130.

The most important feature of the record of casualties to undocumented craft is their number, which was 1,415, or 224 more than was reported for 1915. Of the 3,757 persons on board when they were overtaken by misfortune, 12 were lost. The value of these vessels with that of their cargoes (which was negligible), was $1,139,530, of which amount $70,530 represents the value of the property lost.

There were succored by the life-saving corps during the year a total of 920 persons, to whom 1,234 days' relief was afforded. Of the number first named, 430 were from distressed or disabled vessels, 178 had sought refuge at the stations from storm or been detained on the beaches by high water, etc., while 312 were victims of flood in Texas.

A summary of the year's casualty record of the service follows:

Number of vessels involved	1,937
Vessels totally lost	82
Persons on board	9,296
Lives actually saved	4,762
Lives lost	38
Persons succored	920
Days' succor afforded	1,234
Value of vessels involved	$17,304,840
Value of cargoes	4,203,020
Total value of property involved	21,507,860
Value of property saved	18,783,200
Value of property lost	2,724,660

Exceptional demands were made upon the establishment in certain sections of the country during the year

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

as the result of two disastrous visitations of nature, namely, the memorable blizzard that swept the region of the great lakes from Nov. 8 to 11, 1913, and the devastating flood in Texas in December of the same year caused by the overflow of the Brazos and Colorado rivers.

Of the more than three score vessels damaged or lost in the first instance, 28, valued with their cargoes at $3,204,000, and carrying 222 persons, suffered casualty within the scope of the service. Happily, not a single life was lost from any of the 28.

In the case of the Texas flood, in which thousands of lives were imperiled and millions of dollars worth of property destroyed, practically the entire area affected was outside the recognized field of operations of the life-saving corps. Several crews of boatmen were, nevertheless, dispatched from the Gulf stations of the service into the inundated territory. In the course of their work these crews proceeded fully 150 miles inland and operated at and in the neighborhood of the towns of Bryan, Navasota, Richmond, Rosenberg, Orchard, Quintana, Velasco, Clute, Lake Jackson, Bonney, Anchor, Angleton, Columbia, Brazoria and Thompsons. They were in the flooded regions for varying periods between Dec. 5 and 18, and succeeded in rescuing and succoring, all told, 803 persons, besides saving considerable property.

Vessels Assisted by Life-Saving Crews

It is not claimed that the entire number of 1,937 vessels included in the year's casualty list were assisted by the life-saving corps. A total of 1,799 vessels, valued with their cargoes at $15,184,640, and carrying 7,986 persons, received such aid, however. In 1,476 of the 1,937 instances the service crews worked alone, while on 323 occasions of disaster they had the assistance of revenue cutters, wrecking vessels, etc. In the 138 instances remaining, the vessels meeting casualty were assisted by private agencies only, or else were able to take care of themselves after getting into difficulty.

Aid of more or less importance was also extended to 124 documented and 113 undocumented vessels not included in the foregoing tabular statement, making a total of 2,036 vessels actually assisted by the service crews. In addition, timely warnings were given by the service watchmen and patrolmen to 198 vessels running into danger. There is no means of knowing the number of lives and the value of the property saved by these warnings, but their importance is obvious, considering the circumstance that 132 of the vessels warned were steamers, and that 179 of the warnings were given at night.

Motor Boat Accidents

A paragraph of the report is devoted to comment upon the steadily increasing number of accidents to motor boats being reported from the life-saving stations, and the extent to which such accidents have increased the rescue and salvage work of the corps. A total of 1,133 accidents of the kind were reported during the year. The boats involved carried 3,764 persons, and were valued at $1,542,930. Seven of the 38 persons lost during the year perished in accidents to these boats.

The general superintendent attributes a large measure of the success of the station crews to the service power craft, of which there are considerably more than a hundred of various types employed in rescue and salvage endeavor. These boats make it possible for the life-savers to travel great distances in the aid of distressed vessels, and largely without hindrance from the weather, putting them upon the scene of disaster fresh and unwearied, and in condition to withstand long hours of arduous effort. Of the 4,762 persons conveyed to land or to other places of safety during the year, 2,486 were transported thither by the service power craft alone.

An interesting feature of the report is the statement found under the heading "Miscellaneous Service". It appears that between calls from shipwrecked and distressed mariners the life-savers find time to do odd jobs for their neighbors and others, for the most part along humanitarian lines. "Indeed," says the general superintendent, "the people living in the neighborhood of the stations look to the corps for assistance in all sorts of difficulties." The crews are encouraged to answer these demands whenever it can be done without interfering with their regular duties. The enumeration of services of this character for the year includes the rescue of 156 persons from drowning and from situations of danger on land; the giving of medical and surgical first-aid to 99 persons suffering from sickness, from cuts, bruises, broken limbs, gunshot wounds, etc.; affording shelter and subsistence for varying periods to 490 fishermen, hunters and other wayfarers driven by storm and flood to seek refuge at the stations; the recovery of the bodies of 166 persons—bathers, swimmers and others—who were drowned or met death in other ways; the saving of various articles of personal property, such as fish nets, buggies, wagons, automobiles, domestic animals, etc., from the sea, from bogs and from mire and quicksand; service at fires involving both public and private buildings, forests, etc., of which there were 58 instances during the year; building coffins for the poor, conducting funeral services and performing burials.

Retirement for Life-Savers

The general superintendent again urges the enactment of legislation to provide retirement pay for members of the life-saving crews and certain officers of the field force of the service who may be incapacitated for duty.

The net expenditures for the maintenance of the service during the year were $2,309,317.41.

The Border Line Transportation Co., Seattle, Wash., has purchased the controlling stock of the Northland Steamship Co., which has a capital of $200,000. The amalgamation of the Border Line and the Northland interests under the management of Dodwell & Co., Seattle, is another matter of great interest to shipping circles. The latter company will return to the Alaska trade after an absence of 10 years. By the terms of the agreement the ownership of the steamship Al-Ki of the appraised value of $100,000, and the freighter Northland, constructed by the Seattle Construction & Dry Dock Co. in 1909 at an approximate cost of $90,000, are transferred to the Border Line and the steamship Dispatch, purchased some 18 months ago by the Border Line and recently remodeled at a cost of $12,000, will be operated with the other vessels in connection with the service in southeastern Alaska.

The Southern Steamship Co., 608 Bourse building, Philadelphia, Pa., recently added to its fleet five steamers, viz., Altamaha, Ocmulgee, Ogeechee, Ossabaw, Satilla, formerly operated by the Texas City Steamship Co., thus giving the company eight steamers operating from Philadelphia to Tampa, Fla., Port Arthur and Texas City, Texas, with weekly sailings from Pier 46 South Wharves.

The Georgian Bay Shipbuilding & Wrecking Co., Midland, Ont., recently has installed a modern marine railway of capacity to pull out boats 150 ft. in length and to partially dock freighters of the largest size to the extent of 100 ft. for repairs in stern or low damages.

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THE MARINE REVIEW

DEVOTED TO MARINE ENGINEERING, SHIP BUILDING AND ALLIED INDUSTRIES

Published Monthly by

The Penton Publishing Company

Penton Building, Cleveland.

CHICAGO	1521-23 Lytton Bldg.
CINCINNATI	312 Johnston Bldg.
NEW YORK	507 West Street Bldg.
PITTSBURGH	2148-49 Oliver Bldg.
WASHINGTON, D. C.	206 Corcoran Bldg.
BIRMINGHAM, ENG.	Prince's Chambers

Subscription, $2 delivered free anywhere in the world.
Single copies, 20 cents. Back numbers over three months, 50 cents.

Change of advertising copy must reach this office on or before the first of each month.

The Cleveland News Co. will supply the trade with THE MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Co., Breams building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

(Copyright 1914, by Penton Publishing Company)

April, 1915

The Seamen's Bill

Much to everyone's surprise, President Wilson signed the seamen's bill. Many were confident that he would veto this measure owing to the complications which will undoubtedly arise with foreign countries, but after deliberating over it for a week the President was apparently persuaded to sign it. It is true that it has been shorn of a number of its objectionable features but there are enough left to trouble vessel owners.

Section 2, of Section 4516, has been amended to require seamen while at sea to be divided into at least two watches and the firemen, oilers and watertenders into three watches. This will require the addition of another oiler on lake steamers. This section also provides that seamen shall not be shipped to work alternately in the fireroom or on deck nor shall those shipped for deck duty be required to work in the fireroom. In other words, deck hands cannot be used as coal passers. It is also provided that nine hours shall constitute a day's work when in port. Ten hours is the rule at present.

Section 4529 is amended requiring that masters shall pay to every seaman his wages within two days after the termination of the agreement under which he was shipped. This provision is of no effect on the lakes as the men are paid promptly at the end of each trip, with the exception of two companies which have put their pay roll upon a monthly basis.

Section 4530, however, provides that every seaman on an American vessel shall be entitled to receive on demand from the master of the vessel, one-half of the wages which he shall have then earned at every port where such vessel loads or delivers cargo before the voyage is ended, but such demand shall not be made oftener than once in five days. Round trips on the lakes average about ten days, so that under this section seamen could demand one-half of their wages earned at the expiration of the fifth day. The practice on the lakes has been for the master to spontaneously advance small sums to the men upon request, but this provision compels him to give half the wages earned upon demand. There is no question whatever but that the irresponsible element among the crew will take advantage of this provision and probably quit the ship before the termination of the voyage for which they had signed. This section also applies to seamen on foreign vessels while in harbors of the United States and probably will be the cause of a great deal of friction in coast ports.

Section 4559 originally read: "Upon a complaint in writing signed by the first or second officer and a majority of the crew of any vessel while in a foreign port, that such vessel is in an unsuitable condition to go to sea, etc.", has been amended to read: "Upon a complaint in writing signed by the first and second officers or a majority of the crew of any vessel." The significant part of this amendment is that it eliminates the officers altogether and bestows authority upon the majority of the crew.

Section 4600 originally read: "It shall be the duty of all consular officers to reclaim deserters and to discountenance insubordination by every means in their power, etc." It is amended to read: "It shall be the duty of all consular officers to discountenance insubordination by every means in their power, etc." The meaning here is clear. The aid of the government cannot be invoked to overtake deserters.

Section 13, of 4611, is entirely new. It requires that vessels of 100 tons and upwards must have on board a crew not less than 75 per cent of which in each department are able to understand any order given by the officers. Practically all sailors on the lakes can do this. It also provides that 40 per cent in the first year, 45 per cent in the second year, 50 per cent in the third year, 55 per cent in the fourth year after the passage of the act and thereafter 65 per cent of the deck crew, exclusive of licensed officers and apprentices, must have the rating of able seamen. An able seaman is rated as one who has had at least three years' service on deck at sea or on the great lakes and that every person over 19 years old shall be rated as able seamen qualified to serve on a vessel on the great lakes who has had at least 18 months on deck at sea or on the great lakes. Graduates of schoolships approved by the secretary of commerce may be rated able seamen after 12 months' service at sea. The deck crew of a lake vessel consists of two watchmen, two wheelsmen and four deck hands. To comply with this provision two at least of the deck hands will presently have to be able seamen. The perniciousness of this section lies in the fact that it puts a great deal of power in the hands of the Seamen's Union, because they would only have to call off a limited number of seamen to disorganize traffic altogether.

Section 14, of 4611, prescribes the lifeboat equipment and is of no importance as far as the bulk freighters on the lakes are concerned as they already carry an excess of equipment. However, the section presents many problems as it becomes effective on July 1 and requires certificated lifeboat men for manning the boats. By this is meant a member of the crew who holds a certificate of efficiency issued under the authority of the secretary of commerce, and in order to obtain it he must prove to the satisfaction of an officer designated by the secretary of commerce that he is familiar with launching lifeboats and the use of oars and is acquainted with the practical handling of the boats themselves. Obviously it is going to take some time to get these certificates.

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Lake Trade and Bulk Freighter

THE tables accompanying this article are of great value to everyone associated with the bulk freight trade of the great lakes. The tables show the additions and subtractions to the fleet of bulk freighters since Jan. 1, 1905, which period embraces the advent of the so-called big ship on the lakes. The carrying capacity of these vessels in gross tons is given showing the amount of freight that the bulk freight fleet can carry on a single trip. The table also shows the iron ore, coal and grain carried during the past ten years. In these calculations only actual bulk freighters have been considered, that is to say, vessels available for carrying ore, coal and grain. Neither the package freighters nor the lumber carrying fleet are included. The tables show that during the past ten years 191 bulk freighters have been added to the available fleet and 160 subtracted therefrom. The subtractions include the wastage of the elements, transfers to the coast and sales to other trades.

An analysis of these tables will prove very interesting. While there are only 28 more bulk freighters on the lakes than there were ten years ago, the carrying capacity of the fleet has increased from 1,919,285 tons to 3,066,423 tons on a single trip, a gain of 1,147,138 tons. The table shows, of course, that the trade of the lakes is subject to very violent fluctuations when one year is compared with the preceding year, but judged in cycles say of five years each, the trade is clearly shown to be one of constant progression. For instance, from 1905 to 1909 the trade expanded practically 14,000,000 tons, while the gain from 1909 to 1913 was 29,000,000 tons. The year 1914 exhibits a sharp decline, which is due wholly to a nation-wide depression; yet it was not until 1907 that the business of 1914 was ever exceeded on the lakes, and we have had one year since then, namely, 1911, when the total freight moved fell below that of 1914. We must therefore expect certain lean years in lake traffic and rest secure in the conviction that we are bound to recoup handsomely in the years following.

TABLE NO. 1.—LAUNCHINGS AND WASTAGE

Year.	Launchings.	Subtractions.
1905	29	33
1906	40	18
1907	40	16
1908	24	4
1909	17	5
1910	20	17
1911	5	8
1912	5	22
1913	4	28
1914	7	9
Total	191	160

TABLE NO. 2—SHOWING BULK FREIGHT CARRIED

Year.	Iron ore, gross tons.	Coal, net tons.	Grain of various kinds, net tons.	Total net tons.
1905	33,476,904	14,401,199	6,112,859	58,007,070
1906	37,513,589	17,273,718	6,863.068	66,152,006
1907	41,290,709	21,486,927	7,010,937	74,743,458
1908	25,427,094	19,288,098	6,024,493	53,790,938
1909	41,683,599	18,617,396	6,651,245	71,954,272
1910	42,618,758	26,478,068	5,803,514	80,014,591
1911	32,130,411	25,700,104	6,959,465	68,645,629
1912	47,435,771	24,673,210	9,372,252	89,040,063
1913	49,070,478	33,362,379	11,697,160	100,018,464
1914	32,021,897	27,281,228	9,793,850	72,939,603

TABLE NO. 3.—NUMBER AND TONNAGE OF BULK FREIGHTERS

Year.	No. of vessels Jan. 1.	Tonnage of same. Gross tons.	New tonnage constructed. Gross tons.	Tonnage subtracted. Gross tons.
1905	518	1,919,285	260,200	114,374
1906	514	2,065,111	381,000	40,987
1907	542	2,442,754	368,000	46,973
1908	567	2,766,781	101,400	14,837
1909	587	2,853,344	157,300	37,197
1910	589	2,973,447	194,500	60,617
1911	592	3,108,330	55,000	29,477
1912	589	3,135,953	49,500	60,945
1913	572	3,124,508	28,000	120,919
1914	548	3,031,589	61,000	26,166
1915	546	3,066,423	.....	.....

Grain Receipts at Buffalo

Following is a statement of the grain received at Buffalo for the past three seasons:

	1914.	1913.	1912.
Flour, bbls.	9,100,752	9,481,131	7,584,753
Wheat, bu.	100,442,591	114,129,472	108,225,504
Corn, bu..	14,309,078	18,960,144	12,750,250
Oats, bu...	11,858,666	20,517,487	10,580,150
Barley, bu.	13,229,162	17,455,376	12,176,925
Rye, bu...	4,268,738	1,076,243	1,250,215
Total grain	144,108,323	172,138,722	144,983,044
Flour to bu..	45,503,760	47,403,655	37,923,765
Total	189,612,083	219,542,377	182,906,809
Flax bu...	10,127,146	20,306,718	14,810,325
Grand total	199,739,229	239,849,095	197,717,134

The Union Iron Works, San Francisco, Cal., has closed contract with Rolph & Co., of that city, for the construction of an 8,000-ton cargo steamer.

The Great Lakes Towing Co., of Cleveland, has declared a quarterly dividend of 1¾ per cent, payable April 1.

Ore Unloading Record

No ore or coal loading or unloading records were broken on the lakes during 1914. The most rapid dispatch in unloading during 1914 was the unloading of the steamer J. C. Wallace with 10,208 gross tons in 3 hours and 13 minutes, working out at 3,120 tons per hour. The next best record was that of the steamer J. P. Morgan with 11,022 gross tons in 3 hours and 32 minutes, working out at 3,060 tons per hour. Both these records were achieved at the Pittsburgh & Conneaut Dock Co.'s dock at Conneaut, O. These records of course do not compare with the record made on the steamer Widener, in 1912, when 10,636 tons were unloaded in 2 hours and 50 minutes, the detail being published in our annual report for 1912.

The best unloading record made at the Ashtabula & Buffalo Dock Co.'s dock at Ashtabula Harbor during the season was the unloading of 10,207 tons in 3 hours and 45 minutes with four machines, the figures working out at 680.47 tons per machine per hour.

A. A. Raven, president of the Atlantic Mutual Insurance Co., of New York, has just retired to become chairman of the board. He is succeeded as president by Cornelius Eldert, formerly vice president who has been connected with the Atlantic Mutual for 49 years. Walter Woods Parsons, who was second vice-president, has been elected vice president and Charles E. Fay, formerly third vice president, becomes second vice president. Mr. Raven has for years been recognized as the leading authority in America on marine insurance.

At the annual meeting of the Dominion Marine Association the following officers were elected: President A. A. Mathews; first vice president, H. W. Richardson, Kingston; second vice president, W. E. Burke, Montreal, of the Canada Steamship lines; general counsel, Francis King, Kingston; executive committee, W. L. Reed, Toronto, of the Canada Lake & Ocean Navigation Co.; and Dennis Murphy, Ottawa, of the Ottawa Transportation Co.

The Lighthouse Department will presently advertise for bids for the construction of the lighthouse tender Cedar for service in Alaskan waters. Congress appropriated $250,000 for the construction of this vessel.

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Average Lake Freight Rate

There is appended herewith the usual annual summary of freight rates on the great lakes for the season of 1914. These rates are in all respects lower than they were during 1913 and as the volume of business handled was considerably less, it is clear that there could have been but little money made in the lake carrying business last year. The freight rate on iron ore was cut five cents, making the rate 50 cents from the head of the lakes, 45 cents from Marquette and 35 cents from Escanaba, out of which the ship paid ten cents for unloading. It is not likely that any except the largest class of carriers made any money on this basis. The coal rate to Lake Michigan ports was also cut five cents, though no reduction was made in the coal rate to Lake Superior ports. The lumber rate was uniformly lower throughout the year, working out at an average of about $2.25 for the season.

The grain rate was a disappointment from the beginning to end and the average works out at 1.13 cents per bushel on wheat from Chicago to Buffalo and 1.14 cents from Duluth to Buffalo. These figures are the average of the daily rate and do not take into consideration vessels that were chartered ahead. Some vessels made charters in August to move grain during the fall months at rates that were better than the daily rate prevailing when the cargoes were moved. While the grain rate opened at the head of the lakes at 1¼ cents, it declined quickly to 1 cent, going down to ⅞ cent on May 13, and to ¾ cent on May 27. It continued to fluctuate from ¾ to 1 cent until September, though there were a few occasional days upon which 1⅛ cents were paid. The rate went to 1¼ cents by Nov. 7, and reached 2¼ cents on Nov. 18, which was the highest daily rate paid during the season. It fell to 1¾ cents on Nov. 28 and for the few cargoes that were moved after Dec. 5, 3 cents was paid.

AVERAGE DAILY FREIGHT RATES 10 YEARS, ENDING WITH 1914

	Cents.
Iron ore, head of Lake Superior to Ohio ports, gross ton	64½
Iron ore, Marquette to Ohio ports, gross ton	59½
Iron ore, Escanaba to Ohio ports, gross ton	49½
Soft coal, Ohio ports to Milwaukee, net ton	37
Soft coal, Ohio ports to Duluth, net ton	31
Hard coal, Buffalo to Chicago, net ton	38
Hard coal, Buffalo to Duluth, net ton	31
Wheat, Chicago to Buffalo, bu.	1.40
Wheat, Duluth to Buffalo, bu.	1.72
Lumber, head of lakes to Ohio ports	252.60

AVERAGE LUMBER RATES, DULUTH TO LAKE ERIE PORTS.

1914	$2.25	1906	$2.71
1913	2.56	1905	2.45
1912	2.76	1904	2.54
1911	2.60	1903	2.57
1910	2.34	1902	2.54
1909	2.40	1901	2.66
1908	2.61	1900	2.33

AVERAGE FREIGHT RATES ON IRON ORE PER GROSS TON FROM PORTS NAMED TO OHIO PORTS--TABLE COVERING WILD AND CONTRACT RATES FOR 26 YEARS PAST

	Escanaba.		Marquette.		Ashland and other ports at the head of Lake Superior.	
Year.	Wild or daily rate. cents.	Contract rate. cents.	Wild or daily rate, cents.	Contract rate, cents.	Wild or daily rate, cents.	Contract rate, cents.
1889	1 01	1 00	1 19	1 10	1 34	1 25
1890	89	1 10	1 07	1 25	1 17	1 35
1891	84	65	1 02	90	1 11	1 00
1892	74	1 00	98	1 15	1 15	1 25
1893	56	85	71	1 00	77	1 00
1894	46	60	60	80	78	80
1895	73	55	92	75	1 13	80
1896	52	70	66	95	77	1 05
1897	45	45	55	65	57	70
1898	51	45	60	60	62	60
1899	95	50	1 08	60	1 29½	60
1900	69½	1 00	78½	1 10	84½	1 25
1901	64	60	79	70	89	80
1902	59	60	66	70	77	75
1903	61	65	72	75	81	85
1904	53½	55	62	60	70	70
1905	61	60	70	70	77	75
1906	60	60	70	70	75½	75
1907	60	60	70	70	75	75
1908	50	50	60	60	65	65
1909	52	50	61	60	66	65
1910	55	55	65	65	70	70
1911	45	45	55	55	60	60
1912	39	35	49	45	54	50
1913	40	40	50	50	55	55
1914	35	35	45	45	50	50

Charge to vessels in 1914 for unloading iron ore was 10 cents per ton.

Average ore rate for the entire period of twenty-six years: Escanaba, wild 56 cents, contract, 54½ cents; Marquette, wild, 66½ cents, contract, 71½ cents; Ashland and other ports at the head of Lake Superior, wild 74 cents, contract 72½ cents.

Average for past ten years: Escanaba, wild 49½ cents, contract 49 cents; Marquette, wild 59½ cents, contract 59 cents; Ashland and other ports at the head of Lake Superior, wild 64½ cents, contract 64 cents.

AVERAGE RATES ON WHEAT PER BUSHEL BY LAKE FROM CHICAGO TO BUFFALO.

Year.	Cents.	Year.	Cents.	Year.	Cents.
1860	9.89	1877	3.72	1895	1.97
1861	11.53	1878	3.07	1896	1.70
1862	10.49	1879	4.74	1897	1.56
1863	7.51	1880	5.75	1898	1.53
1864	9.58	1881	3.44	1899	2.71
1865	9.78	1882	2.50	1900	1.79
1866	12.34	1883	3.41	1901	1.42
1867	6.67	1884	2.18	1902	1.51
1868	7.14	1885	2.02	1903	1.41
1869	6.81	1886	3.68	1904	1.32
1870	5.88	1887	4.13	1905	1.67
1871	7.62	1888	2.56	1906	1.72
1872	11.46	1889	2.51	1907	1.57
1873	7.02	1890	1.96	1908	1.00
1874	4.03	1891	2.38	1909	1.56
1875	3.42	1892	2.38	1910	1.44
1876	2.90	1893	1.66	1911	1.08
		1894	1.27	1912	1.39
				1913	1.43
				1914	1.13

Average for 55 years, 3.97.

Charges to vessels for shoveling, trimming and tallying weights of grain amounted to $4.12½ per 1,000 bu. in 1914.

LAKE FREIGHT RATES ON WHEAT, DULUTH TO BUFFALO.

Year.	Rate cts.	Year.	Rate cts.
1914	1.14		
1913	2.01		
1912	2.01		
1911	1.17		
1910	1.33		
1909	1.96		
1908	1.22		
1907	1.86	1896	2.12
1906	2.19	1895	3.50
1905	2.31	1894	1¼ @ 3
1904	1.81	1893	1¼ @ 3½
1903	1.6	1892	2¼ @ 4
1902	1.9	1891	1¾ @ 9½
1901	2.3	1890	2 @ 5
1900	2.0	1889	2 @ 5
1899	3.6	1888	2 @ 5
1898	1.8	1887	2 @ 8
1897	1.75	1886	3¼ @ 8

Figures for twenty years past represent average of daily rates for full season; previous to 1895 rates given are highest and lowest of the year.

AVERAGE OF DAILY RATES ON SOFT COAL FROM OHIO PORTS TO MILWAUKEE, ESCANABA, DULUTH, GREEN BAY AND MANITOWOC.

Year.	Milwaukee. Cent.	Escanaba. Cents.	Duluth. Cents.	Green Bay. Cents.	Manitowoc. Cents.
1905	46½	41½	33½	42	41½
1906	46	42	35	42	42
1907	40	35	30	35	35
1908	40	35	30	35	35
1909	37	31	31	32	31
1910	35½	35	31	36	35½
1911	32	31	32	31	31
1912	30	30	30	30	30
1913	35	30	30	30	30
1914	30	30	30	30	30
Average for 10 years	37	34	31	34	34

Chicago rate about same as Milwaukee.

Coal of all kinds shipped in net tons and handled without charge to vessel.

AVERAGE OR DAILY LAKE FREIGHT RATES ON HARD COAL FROM BUFFALO TO CHICAGO, MILWAUKEE AND DULUTH DURING TEN YEARS PAST.

Year.	Chicago. Cents.	Duluth. Cents.
1905	44	34
1906	46	35
1907	40	31
1908	40	30
1909	41	32
1910	41	31½
1911	35	30
1912	30	30
1913	35	30
1914	30	30
Average for 10 years	38	31

Rate to Milwaukee practically the same as to Chicago.

Hard coal is net tons and is handled without charge to vessel.

AVERAGE DAILY RATES OF FREIGHT ON THE GREAT LAKES.

	1912. Cents.	1913. Cents.	1914. Cents.
Iron ore, Escanaba to Ohio ports, gross ton	38.72	40.00	35.00
Iron ore, head of Lake Superior to Ohio ports, gross ton	53.72	55.00	50.00
Iron ore, Marquette to Ohio ports, gross ton	48.72	50.00	45.00
Wheat, Chicago to Buffalo, bu.	1.3936	1.43	1.13
Wheat, Duluth to Buffalo, bu.	2.0192	2.01	1.14
Soft coal, Ohio ports to Milwaukee, net ton	30.00	35.00	30.00
Soft coal, Ohio ports to Duluth, net ton	30.00	30.00	30.00
Soft coal, Ohio ports to Portage, net ton	30.00	30.00	30.00
Soft coal, Ohio ports to Manitowoc, net ton	30.00	30.00	30.00
Soft coal, Ohio ports to Sheboygan, net ton	30.00	30.00	30.00
Soft coal, Ohio ports to Green Bay, net ton	30.00	30.00	30.00
Soft coal, Ohio ports to Escanaba, net ton	30.00	30.00	30.00
Hard coal, Buffalo to Milwaukee, net ton	30.00	35.00	30.00
Hard coal, Buffalo to Chicago, net ton	30.00	35.00	30.00
Hard coal, Buffalo to Duluth, net ton	30.00	30.00	30.00
Lumber, head of the lakes to Ohio ports	276.49	256.00	225.00

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Terminal Facilities of North Pacific Ports, 5 x 7, 336 pages. Terminal Publishing Co., Seattle, Wash.

This book is, as its title indicates, a port directory for the North Pacific. It gives the depths of water in all harbors and also gives customs and tariff regulations at the various ports. Facilities for handling freight are also enumerated.

Artificial Waterways of the World, by A. Barton Hepburn, 5 x 8, 171 pages. The McMillan Co., New York. Price, $1.25.

This book is devoted to the Erie canal, the Panama canal and other American canals. Certain chapters are also devoted to the conservation of our natural resources. Statistics are given of the commerce carried by the various artificial waterways of the world.

Practical Mathematics for Engineers, by F. Hovenden. 5 x 7½. D. Van Nostrand Co. Price, $1.

This book has been specially compiled for the use of apprentices who intend to become marine engineers and is designed to form a sound groundwork upon which the special knowledge necessary to obtain a license may be acquired. It is an extremely practical book on mathematics.

The Dock and Harbor Engineers' Reference Book, by Brysson Cunningham. 6½ x 4½, 320 pages, with 144 illustrations, including six folding diagrams. J. B. Lippincott Co., Philadelphia.

This work is in eight chapters and is the result of the author's professional experience. Every engineer is constantly collecting notes relating to the class of work in which he is interested. The book is got out in pocket size and the author has endeavored to compile and arrange notes which were primarily made for his own use and which he believes to be of general utility. The book is extremely valuable to anyone interested in the construction of graving docks, floating docks, dredging and dock construction.

Elementary Mathematics for Marine Engineers, by J. W. M. Southern, 5 x 8, 174 pages, price $1.50. D. Van Nostrand Co., New York.

This little book is extremely elemental and has been specially written for the use of marine engineers who may not have had the opportunity of taking classes on this subject during their early years. It will be found to be of an extremely helpful nature and is practically a stepping stone between ordinary arithmetic and mathematics proper.

Indicator Diagrams for Marine Engineers, by W. C. McGibbon, 9½ x 7½, 178 pages. D. Van Nostrand Co., New York. Price, $3.

This work is unusually complete. A great number of diagrams inserted at the beginning of the book are especially suitable for students preparing for examination. The book contains 16 chapters and follows the steam engine indicator from the time of its introduction by James Watt. The work is carried throughout with the greatest fidelity and should prove of great value to engineers.

Port Directory of the Principal Canadian Ports and Harbors, by department of marine and fisheries, Ottawa, Can., 7 x 10, 305 pages.

This book is published by the department of marine and fisheries and is intended for the use of ship owners, importers, exporters and insurance companies. It is a pretty complete directory of Canadian ports, embracing the facilities for loading and unloading ships, extent of wharves, capacity of sheds, railway accommodations and gives as well the sailing directions for entering harbor.

Traffic Glossary, by R. E. Riley, 6 x 9, 136 pages. La Salle Extension University, Chicago.

In interstate commerce and railway traffic and in daily traffic work there are used many terms of a technical nature. These terms may be divided into two general classes—one class consisting of definitions of traffic territories and the other consisting of terms having a special technical meaning such as basing points. This glossary has been prepared to provide a ready reference work for those who need a definition of a territorial term or some term having a technical meaning.

Simple Problems in Marine Engineering Design, by J. W. M. Sothern. 8 x 5, 191 pages, D. Van Nostrand Co., New York. Price, $1.

This is the third edition of the book and is considerably enlarged. Tables of areas, circumferences, squares, cubes, square root and cube root are given. Several pages are devoted to simple mathematics. Under the subject of general problems are the measuring of ballast tanks, coal bunkers, weights of metals, capacity of pumps. The third section of the book is devoted to boiler design. The section on engine design is quite extended.

Seaton & Rounthwaite's Pocket Book of Marine Engineering Rules and Tables, by A. E. Seaton and H. M. Rounthwaite, 4 x 6, 713 pages. D. Van Nostrand Co.

Since this work was first published in 1895 it has gone through 12 editions. Obviously during that period conditions of ordinary marine engineering have been considerably modified and the introduction of the turbine and internal combustion engines have all added very materially to the demand for things not then contemplated. In this edition all the tables have been extended up to and even beyond present practice and all the modifications that the rules of the various classification societies have gone through have been noted. Fresh tables have been added to enable students and others engaged in research work to economize

Generated on 2024-07-26 09:48 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

their time. All this has tended to make the work bulkier in form but nevertheless its pocket size is retained.

Verbal Notes and Sketches for Marine Engineers, by J. W. M. Sothern, 6 x 9, 676 pages, 545 illustrations. D. Van Nostrand Co., New York.

This is the eighth edition practically rewritten and reillustrated throughout. The boiler section has received particular attention, practical examples being shown and worked out. As a subject usually neglected in ordinary textbooks, a special section on valve settings has been included which is expected to be useful to junior engineers. This work is intended for the use of naval and mercantile marine engineers of all grades.

Mechanics for Marine Engineers, by A. N. Somerscales, 5 x 8, 278 pages, price $1.50. D. Van Nostrand Co., New York.

This work consists of a practical series of lessons that were prepared for evening classes of students and were designed to give them an intelligent knowledge of the principle of mathematics without a previous training in algebraic and trigonometrical reasoning. The examples in the exercises have been put together with special regard for the requirements of the marine engineer. The mastering of these lessons will give to the student a very satisfactory groundwork and will enable him to take full advantage of a more advanced course.

Laying Off, or the Geometry of Ship Building. By Edward L. Atwood and I. C. G. Cooper. 6 x 9 inches, 115 pages. Price $1.75. Published by Longmans, Green & Co., New York.

This work is adapted for the use of students and the principle adopted has been to describe processes and methods in ordinary shipyard practice. The authors state that although the work of "laying off" is mainly done by a special class of skilled workmen, it is considered very desirable that ship draftsmen and students of naval architecture should be acquainted with the subject. The present work, therefore, ought to be useful to this very large class. The text is illustrated with numerous drawings.

Steam Turbines, by James Ambrose Moyer, 6 x 9, 375 pages. John Wiley & Sons, New York.

This is the second edition, revised and enlarged. This book is in response to the remarkable development that the steam turbine has undergone in the past few years. Most of the additions made in this issue have been in the line of new applications. The chapter on low pressure turbines has been rewritten and extended to include the latest developments. New chapters have been added on Bleeder or extraction turbines and mixed pressure turbines. Recent successful developments in turbine applications are noted, making it a still more important competitor of the reciprocating engine in the non-condensing field. The chapters on heat theory, steam flow, nozzle design, blade design and reaction turbine design have been rewritten and many illustrative examples added.

American Vs. British Wages

The following letter from John Hughes, general agent of the United States Steel Products Co., to Senator Gallinger, of the United States senate, on the cost of operating foreign-built vessels transferred to the American flag is self-explanatory:

Your letter of the 10th instant, addressed to J. A. Farrell, president, United States Steel Corporation, has been referred to us for attention, as this company is the subsidiary of the Corporation which owns the foreign built steamers recently transferred to the American flag. The present and former scale of wages on our steamers and the percentage of increase is shown in the following statement:

Wages of captains under American scale vary according to seniority.

Wages of other officers and the engineers are fixed, being same on all steamers.

	British					American		
	First year. £ s d	Second year. £ s d	Third year. £	Average. £ s d		Average.	Increase. per cent.
Captain	25 00 0	.....	..	25 00 0	($121.66)	$150-180	$165	35.6
Chief officer	14 00 0	15 00 0	16	15 00 0	(73.00)	90	....	23.3
Second officer	10 10 0	11 00 0	12	11 3 4	(54.34)	70	....	28.8
Third officer	9 00 0	.....	..	9 00 0	(43.80)	60	....	37.0
Chief engineer	20 00 0	21 00 0	22	21 00 0	(102.20)	150	....	46.8
First assistant engineer	14 00 0	15 00 0	16	15 00 0	(73.00)	100	....	37.0
Second assistant engineer	10 10 0	11 00 0	12	11 3 4	(54.34)	90	....	65.6
Third assistant engineer	8 00 0	8 10 0	9	8 10 0	(41.36)	80	....	93.4

Safe navigation money to captain $300 per year, payable annually Jan. 1, on showing a clean record for the previous twelve months.

The wages of the following members of the crew vary on the different steamers depending upon the supply available and the port at which signed on. The steamer San Francisco is quoted as an example.

		British.	American.	Increase.
Chief steward	£8	($38.93)	$55	41.2
Second steward	4	(19.47)	25	28.4
Messroom steward	3	(14.60)	22	50.7
Chief cook	7	(34.07)	40	17.4
Second cook	5	(24.33)	25	2.8
Carpenter	7	(34.07)	40	17.4
Boatswain	6½	(31.63)	35	10.7
Sailors	5½	(36.76)	28	4.6
Firemen	5½	(26.76)	32	19.6
Oilers	6	(29.20)	35	19.9
Donkeyman	6½	(31.63)	35	10.7

Owing to the unsettled conditions which have prevailed throughout the world since the outbreak of the present war in Europe, the increased cost of operation in the other departments cannot be fairly stated as we have no basis upon which to make a definite comparison.

Scows for Panama Canal

The purchasing officer of the Panama canal will soon call for bids for furnishing three 1,000-yard steel dump scows. The scows are to have four hoppers, one deck, seven transverse water-tight bulkheads, three longitudinal water-tight bulkheads in each rake, two water-tight longitudinal wing bulkheads, and one center line structural truss; the last two items extending from hopper end bulkhead to peak bulkhead at each end of scow. There will be eight wooden steel sheathed hopper doors or gates, completed, with hinges, lifting chains, etc. The doors are to be dropped by manual power and raised with a reversing steam engine geared to hopper door shafts. The dimensions are: Length over all, 160 feet; length on bottom, 129 feet; beam molded, 50 feet 6 inches; depth molded, 13 feet 6 inches; draft, loaded, 11 feet.

The Anderson Ship Building Co., Seattle, Wash., has secured contract from the Eagle Harbor Transportation Co., for the construction of a new steel passenger and freight steamer to be 120 feet long, 25 feet beam and 8 feet molded depth. She will be equipped with triple-expansion engines and Almy water-tube boilers. Contract calls for delivery May 1.

The steamer Admiral Watson, of the Pacific Alaska Navigation Co.'s fleet is being remodeled at the yard of the Seattle Construction Co., Seattle, Wash. The changes include new social hall, saloon, observation room and the installation of the new coal storage compartment and ice-making machinery.

In the report of the annual meeting of the Lake Carriers' Association in the March *Marine Review*, J. H. Sheadle, in his remarks on welfare work, was quoted as saying: "The most startling and gratifying decrease is that of 5 per cent in the number of accidents attributable to intoxication." This should have read 75 per cent instead of 5 per cent.

Generated on 2024-07-26 09:49 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Shrapnel Shells

By R. B. Wallace

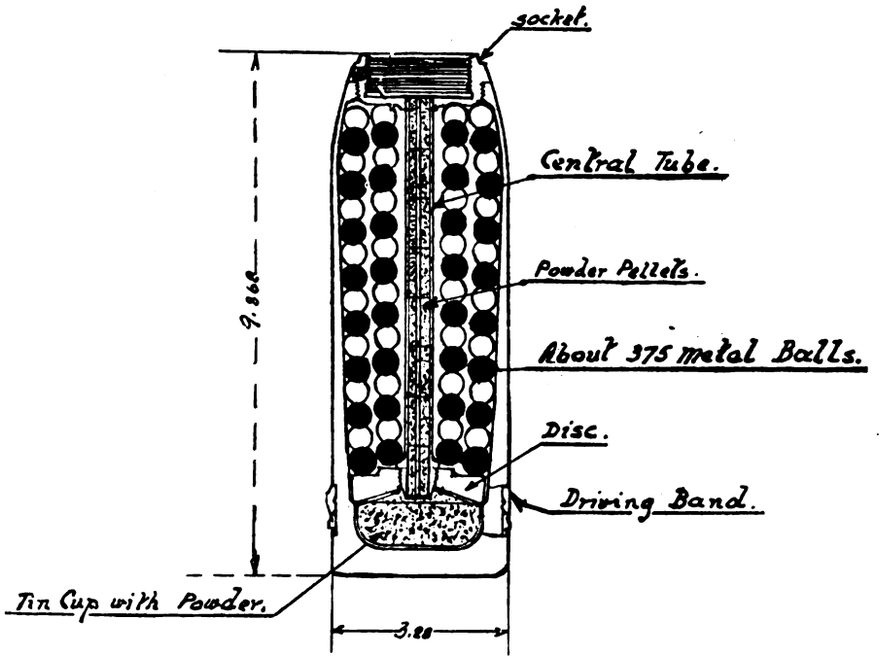
The marine business of Canada having received severe reverses, caused directly by the present European war, it entered into our minds that, having deprived us of one source of revenue, the prevailing conditions must be utilized through some source to be of benefit to us. After considerable investigation and solicitation, an order was received for the machining and assembling of 15,000 18-pound shrapnel shells; and a corner of the machine shop has been given over and is being equipped to handle this business. To obtain an order for 15,000 shells, it was necessary to guarantee the production of 1,000 shells per week, requiring considerable addition to our present machine shop equipment, such as turret lathes, tempering forges, etc., and requiring also the operation of our machine shop day and night.

The Port Arthur plant will hardly be able to depend entirely upon the marine business as a visible means of support for some time to come, and thus the machinery and equipment for the shell process, is peculiarly adapted to the manufacturing of hoisting engines, clam shells, etc., which is at present under consideration.

The process of machining and assembling shrapnel shells is as follows, and is one of the cleanest and most ingenious operations the writer has ever had the pleasure of witnessing. The component parts of the shell, namely, the brass socket, the plug, the brass tube, the steel diaphragm, the powder receptable or tin cup, the copper band, the bullets and the resin in which the bullets are set; are all furnished by the government through various tributaries, and delivered free of charge to us, the steel forged body only being received a rough casting.

This steel body is first faced off on both ends to the approximate length, and then goes to the turret lathe for the first operation. Chucking the shell by the nose or open end, the base is faced off to finish size, and the outside of the shell roughed toward the nose for about 7 inches, and the outside turned to finish size as far as the copper band groove. The groove is then made and under-cut and a waving double thread cut in the bottom of the groove to act as an anchor for the copper band and prevent its turning when the shell is fired.

The steel body is now ready for the second operation. It is chucked from the base, or finished end, in another turret lathe and the recess that receives the powder receptacle is roughed out and the shoulder upon which the steel diaphragm rests is roughened out. The recess is then finished and the shoulder finished. At the same time, about 2 inches from the shoulder out towards the nose, the interior is bored slightly taper to conform to given dimensions. During this operation the balance of the outside of the shell is rough turned to the end, and with a slight taper, increasing the thickness of the body about 1½ inches from the nose, to allow for the bending moment when the nose of the shell is closed in later.



Partly Finished Shell

The partly finished shell now goes into the tempering furnace and is heated to about 1,500 degrees Fahr., and quenched in a tempering oil bath. Being raised from the bath and the oil having been cleaned from same, the shell now goes to another tempering furnace and is heated to about 800 degrees Fahr., removed and allowed to cool slowly on a warm steel plate, thus slightly drawing the temper.

The next operation consists of immersing the nose for about 2 inches from the end in a hot lead bath, to bring the said 2 inches of the shell up to a cherry red heat quickly, so as not to disturb the temper of the balance of the shell. Thus heated, the shell is placed in a press containing a die shaped as the finished nose of the shell. In this press the end of the shell is closed in and the shape of the nose thus formed. The shell is then returned to the lead bath, the nose reheated and then placed, nose down in slacked lime and allowed to cool.

The shaped and partly finished body is next cleaned circumferentially on a small section and placed under a scleroscope and scleroscoped on three equal parts of the circumference, to determine the hardness of the steel, and must be between 40 and 43, so as not to be too hard for the machining nor too soft to stand the tensile strength test.

Out of every batch of 120 shells, at this point in the process, one shell is taken, and from three equal points on the circumference, and near the base, a test piece is milled and must stand the following test in a testing machine operated by a government inspector, or the entire 120 shells be rejected: Yield test, 6 per cent; breaking test, 12 per cent. Elongation test, in a test piece 2 inches long and 0.564-inch in diameter, 10 per cent.

The shell is now returned to another turret lathe, and the nose end faced off to make the required given length. The nose end is then threaded to receive a brass socket, and shouldered on the inside.

From this lathe the shell follows into an engine lathe or grinder, and the last finish cut is made from the groove to the end of the nose, being a slightly tapered cut and following the shape of the nose.

The next operation consists of placing the shell in a six-point press and a pure copper band is pressed into the undercut groove at a hydraulic pressure of 1,200 pounds. This

From the *Live Wire*, published by the American Ship Building Co.

Generated on 2024-07-26 09:50 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

band is then rough turned and finished to a gage by a forming tool in an engine lathe, and must be absolutely correct, as this band is the one particular part that conforms to the rifling of the gun, and which thus causes the revolving movement of the shell when fired.

Inspection of Shell

The shell, being now completely finished, is inspected on the inspection bench by inspectors who use about 74 gages, one each high and low gage of 37 given sizes, and the shell must not vary from given dimensions over a few thousandths parts of an inch. Any shell found to be over or under size is of course rejected.

Before being filled and assembled the shell must be thoroughly cleaned, and a hot caustic soda bath is prepared in cauldron kettles for this purpose. Being clean and dry, the shell is now placed on the assembly bench and the powder receptacle (tin cup) installed under the steel diaphragm which was inserted just previous to the operation of closing the nose. Through the diaphragm and into the tin cup is screwed the brass central tube, and a cup jig temporarily placed on the nose to hold the brass tube central. The shrapnel lead bullets are now weighed out (41 to the pound), and about 375 poured into the shell. After being jarred into place, hot resin is poured in among the bullets, completely filling the shell, which resin later cools and sets the bullets in a hard bed. The brass socket is then screwed into the nose, the temporary cup jig having been removed, and the central brass tube is soldered where it enters the socket, to insure a moisture-proof end.

The last operation consists of turning off the brass socket to gage in an engine lathe and of screwing in a temporary brass plug. Later on, at the arsenal or in the field, this brass plug is removed, the powder charge poured down the tube, the time fuse installed in the tube and a point-shaped detonator cap screwed on the end.

The shell being thus complete and having passed all shop and government inspection (the government having an inspector in the shop to gage each shell) it is placed on the scales and should slightly overbalance the weight set and specified. The government inspector then places a 4½ dram weight opposite the shell and on the weight side, which must bring the shell up to an even balance, or the shell will be rejected. You will therefore readily see why it is most essential that the given dimensions be strictly adhered to, not in regard to fit, as the copper band alone fits the rifling of the gun, but that the finished shell shall contain the correct amount of weight of material.

From each batch of 120 shells thus finished and passed, one shell is taken at random, and sent to Quebec, for what is known as the firing proof test. It is there fired from an 18-pound gun into a bank of sand at a given range and later recovered, and must be found to have complied with the following extract from the specifications, or else the entire 120 shells shall be rejected:

"Proof.

"(a) A percentage of the shells will be fired for recovery from an 18 pr. Q. F. gun, with such a charge as will give a chamber pressure, but not less than 15 tons per square inch. Should the shells so fired set up above the high diameter of body, or break up in the gun, or should any portion of the driving bands separate from the shells before first graze or impact, or should the recovered shells show that the shock of discharge had distorted the disc supporting the bullets, or cause such alteration of the internal parts as would interfere with the correct action of the shell, or should any of the components be incorrect, the lot will be rejected. Further, should the shell be reported unsteady in flight, and be found on recovery to be without its driving band, or with the driving band loose or slipped in its seating, then the driving band of a similar number of shells to that taken for firing proof may be cut out to ascertain whether they have been properly pressed on; if they have not been pressed down to the satisfaction of the chief inspector, the lot will be rejected. If found correct, such shells will be rebanded by the contractor free of charge.

"(b) The shells fired for proof may, after recovery, be broken to ascertain the soundness of their material. Should any of the material be unsound in any respect, the lot will be rejected.

The Completed Shell

"(c) Rejected shells will, if considered necessary, be marked with a small rejection mark, so that they can be easily identified if re-delivered."

Having passed all tests, the completed shell is now boxed in a plain wooden case with hardwood ends, six to the case, and shipped to the arsenal, ready for field use.

At the present time, 2,400,000 of this particular style of shell alone are being manufactured in this country, and such a business itself offers a slight recompense for the destruction and loss along other lines.

Elected to Membership

The following are additional to the list elected to membership in the Society of Naval Architects and Marine Engineers as published in the February MARINE REVIEW:

For Members

Ellsworth P. Bertholf, captain commandant, United States revenue cutter service, Washington, D. C.

Carl K. MacFadden, fuel oil engineering department, Inter-Ocean Oil Co., 90 West street, New York.

William S. Owen, assistant professor, naval architecture and marine engineering, Webb's academy, New York City.

Eugene E. O'Donnell, supervising inspector, steamboat inspection service, 39 Dakota street, Dorchester, Mass.

Samuel R. Percy, shipbuilder, Percy & Small, Bath, Me.

Robert Warriner, chief engineer, Fore River Ship Building Co., Quincy, Mass.

Associate to Member

Charles E. Ross, consulting engineer, 52 Beaver street, New York.

Edward Smith, president, American Ship Building Co., Cleveland, O.

Associate

Frank S. Masten, proctor in admiralty, Rockefeller building, Cleveland, O.

F. L. Andrews, general manager, Hyde Windlass Co., Bath, Me.

Edward O. Cutler, assistant manager, Craig Ship Building Co., Long Beach, Cal.

Authorities at Washington have finally settled the question on which hinged the reconstruction of the government drydock at Pearl Harbor, and a contract for the work has been closed with the Hawaiian Dredging Co. While one of the sections was being pumped dry for the first time, hydrostatic pressure underneath the structure burst the concrete floor, practically wrecking the drydock and giving rise to a long investigation, not only as to the cause of the accident, but also as to whether the financial responsibility should rest on the contractors or the government. Several official reports were made by army and private engineers as to the cause of the failure and the proper method of reconstruction. It is now announced that the pontoon method, which was recommended by Alfred Noble, will be used in rebuilding the structure.

Generated on 2024-07-26 09:50 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

McNab Cascade Boiler Circulators

The McNab Co., Bridgeport, Conn., has received some very interesting reports from the American-Hawaiian Steamship Co. regarding the performance of its Cascade boiler circulators and fuel economizers on some of its vessels. Following is the average of ten passages of the oil-burning steamer Mexican in the Pacific route between Salina Cruz and San Diego before the circulator was installed:

Knots per hour.	Fuel per day, bbls.
11.65	345
Knots per barrel.	Displacement tons.
0.817	13,230

Following is the average of 13 passages in the Pacific route between Hilo (Honolulu) and Salina Cruz by the same steamer before the circulator was installed:

Knots per hour.	Fuel per day, bbls.
10.55	345
Knots per barrel.	Displacement tons.
0.75	17,850

It will be noted that the consumption of fuel is the same in both the above averages regardless of displacement.

The following report was taken from an average of one round trip voyage from New York to Honolulu via the Panama canal and San Francisco after the Cascade boiler circulator was installed:

Knots per hour.	Fuel per day, bbls.
11.6	288
Knots per barrel.	Displacement tons.
0.94	16,000

This shows a saving of 16½ per cent in fuel over any previous showing made by that vessel.

The average of ten trips between Salina Cruz and San Diego by the steamer Columbian before installation worked out as follows:

Knots per hour.	Fuel per day, bbls.
11.73	336
Knots per barrel.	Displacement tons.
0.84	12,854

On 16 passages between Hilo and Salina Cruz the result before installation was as follows:

Knots per hour.	Fuel per day, bbls.
10.6	336
Knots per barrel.	Displacement tons.
0.745	17,350

It will be seen that the fuel consumption is the same in both averages regardless of displacement.

The average of one round trip from New York to Honolulu via the Panama canal after the circulator had been installed was as follows:

Knots per hour.	Fuel per day, bbls.
11.3	290
Knots per barrel.	Displacement tons.
0.97	17,400

This result shows a saving of 46 barrels of fuel oil per day, or a saving of over 13½ per cent. An increase of speed of 6 per cent was also noted on equivalent displacement.

The McNab Co. received the following letter on Dec. 14, 1914, from W. C. Richardson & Co., of Cleveland:

"The steamer David Z. Norton in 1913 burned 4,600 tons of fuel. In 1914 she burned 3,600 tons, or about 1,000 tons less in 1914 than in 1913. So it goes to show that your circulator saved the Norton some fuel, and the same applies to the steamer Leonard B. Miller and the steamer C. Russell Hubbard. The fact that the boats did not run as many miles in 1914 as in 1913, but you can safely say there was a saving of about 600 tons on each boat. This you can publish in your new book."

The above shows an actual saving in fuel of 13 per cent per vessel.

Capt. William Smith, master of the steamer Harvester, of the Wisconsin Steel Co., wrote as follows:

"In reply to your letter of Oct. 25, regarding Cascade boiler circulators which were installed on the steamer Harvester beginning season 1914, I must say they have given entire satisfaction and have created a large saving in fuel. I will give you a comparison for 25 trips, season 1913 and 1914. Season of 1913 for 25 trips we consumed 6,245 tons of fuel running 41,046 miles. Season of 1914 we consumed for 25 trips 5,625 tons of fuel, running 39,381 miles. We used the same kind of fuel both last year and this year and made the same speed both seasons."

John H. Graham, superintending engineer of the A. H. Bull Steamship Co., of New York, wrote:

"For your information we are pleased to say that we find a saving of 7½ per cent in the consumption of our steamship Dorothy since installing the McNab Cascade circulators. This record is taken for a period covering 22 voyages since the installation of the circulators."

The A. H. Bull Steamship Co. has recently completed the installation of McNab Cascade circulators on their steamer Millinocket.

Following is a report on the performance of boilers in the steamship Brabant, of the Texas Co. after Cascade circulators were installed. The boilers were filled by means of injectors, giving initial temperature of water 130 degrees Fahr. The burner was lighted in center furnace only of each boiler as this was the method ordinarily used on this ship to raise steam, under which condition 3½ hours were necessary before steam showed at vent.

	Time.	Gauge. lbs.	Bottom temp., deg.	Temp. steam space, deg.	Diff., deg.
Fire started...	12:30				
Steam showed.	1:55				
	3:07	35	275	280	5
	3:35	60	302	307	5
	3:50	80	315	323	8
	4:08	120	345	350	5
	4:15	135	355	358	3
	4:25	150	362	365	3

Time to show steam, 1 hour 25 minutes.

Total time to raise steam to 150 pounds, 3 hours 55 minutes.

After gage showed 90 pounds wing furnace burners were lighted.

Bottom temperatures were taken by socket thermometers tapped through heads of boilers near bottom.

Steamship Bostonian

Harland & Wolff, Ltd., launched from their Glasgow yard the twin-screw motor vessel Bostonian for the Leyland line during January. The vessel is 414 feet in length over all and 52 feet beam, with a gross tonnage of about 6,500. The new vessel, which has been built to the highest class at Lloyd's and under board of trade survey for passenger certificate, has been specially designed for the Atlantic trade. She has a double bottom fore and aft between the peak bulkheads and three complete steel decks and bridges, and eight watertight bulkheads carried to the upper deck. There are six cargo holds, each with a large hatch served by powerful derricks of four, six and 15 and 30 tons lifting capacity. The vessel will also have accommodation for a number of passengers.

The Bostonian will be fitted with Diesel oil engines. The advantages of internal combustion engines for marine purposes on the Diesel system have been demonstrated in a number of vessels already constructed. All deck machinery, including steering gear and windlass, will be electrically operated.

With reference to the requirements of the United States steamboat inspection service calling for one motor life boat on ships sailing outside of 200 miles from shore, it is of interest to note that some attention was paid to the exhibit of the C. M. Lane Life Boat Co., at the Motor Boat Show last week. This firm exhibit a 24-foot metallic power life boat with a 14-horsepower Frisbie motor in it, fully equipped for ocean service and ready to be put on board the steamship, inspected and passed by the United States steamboat inspection service.

Generated on 2024-07-26 09:50 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Gyroscopic Compasses

E. Kilburn Scott's paper on "Gyroscopic compasses, with particular references to the 'Sea Star' type," was discussed at a meeting of the Institute of Marine Engineers recently.

Kilburn Scott, in the course of his paper, which was read the previous week, said the advent of the iron ship rendered the use of the ordinary compass unsuitable, and compensating devices had to be added to minimise the effect of outside magnetic influences. Even with the best of these devices, however, the compass has never been entirely satisfactory. On warships especially the compasses are very susceptible to variations because of the large masses of steel, such as guns and turrets, which have to be moved, and which thus alter the induced and semi-permanent magnetism. The conditions on submarines are such as to render magnetic compasses most unreliable for these vessels.

Another type, the gyroscopic compass, has therefore been developed, which is quite independent of the earth's magnetism. The gyroscopic compass possesses a directive force in some respects analogous to the magnetic compass, and according to the direction of spin of the wheel, the ends of the gyro-wheel axes may be called north-seeking and south-seeking. The tendency to seek the pole is, however, many times greater than is possible with the magnetic compass, and it mainly depends on the effect of the earth's rotation on a rapidly-spinning wheel, the kinetic energy of which may be made as much as desired. A great advantage of the compass is that it is easy to repeat all the movements on repeater compasses, while the master compass can be placed in a position where it is absolutely safe. Any kind of metal can be used in close proximity to a gyro-compass.

Although Foucault discovered as long ago as 1852 that, when suitably constructed, the gyroscope tended to point to the true or geographical north, it is only within the last few years that practical instruments have been constructed which will work on board ship.

The Anschutz type, evolved by Dr. Anschutz in 1900, is of pendular construction, and is free to swing under the influence of gravity. To counteract the effect of violent rolling three gyro-wheels are employed. The wheels run at about 20,000 revolutions per minute, and the periodicity is 333 per second. Spirit levels attached to the card indicate at once if the compass is pointing true north.

The Sperry compass is suspended by means of a wire, and is provided with an automatic "follow-up" device to take the twist out of the suspension wire directly the gyro-wheel moves, and to relieve the gyro-wheel from the task of overcoming friction round the vertical axis. The follow-up motor is a most essential feature of the Sperry compass. It drives round the compass card, transmitting gear, etc., and leaves the gyro-wheel very little work to do. The latter can thus be made extremely sensitive to precessional action set up by the earth's rotation. The wheel revolves at 8,600 revolutions per minute, and the periodicity is 145 per second.

The errors peculiar to these compasses, for which allowances are to be made, are those due to latitude, change of latitude at constant speed, change of speed, rolling and pitching slowness of gyroscope, and those produced by steering. These errors, the author stated, could be traced to one feature, which both the Anschutz and the Sperry compasses have in common, viz., that they are pendular, that is to say, they depend upon the force of gravity as the smallest warships, and their engineering feature is that the gyro-wheel is so mounted that it is non-pendular about its horizontal axis, and therefore is not subject to ballistic effects. One object in view is to dispense with correction tables and mechanical correctors; another to devise an instrument that could be made small and cheaply so as to be of use on merchant vessels, aeroplane, etc. The "Sea Star" differs from the Anschutz and Sperry types in that the direction of rotation of the gyro-wheel is clockwise when looking at the north pointing end of the gyro-wheel spindle. The other two run counter-clockwise. Owing to the direction of rotation of the "Sea Star" gyro-wheel being opposite to the rotation of the earth, the gyro-wheel is in a state of permanent unstable equilibrium, and, therefore, as soon as it has been deflected in the slightest degree there is a strong tendency to increase, and the motor is immediately started to correct the deviation. There is thus a very great sensitiveness when in the meridian, and this sensitiveness allows the "Sea Star" type to be built in small sizes, for the kinetic energy of the wheel is of lesser importance than with other compasses.

Hall Bros., Winslow, Wash., recently launched the United States lighthouse tender Fern, to replace the old tender of the same name. The new vessel cost $65,000 and is intended for service in Alaskan waters with headquarters at Ketchikan.

Survey of Kuskokwim River

Secretary of Commerce Redfield has announced that a practical navigable channel from the Bering sea into the mouth of the Kuskokwim river has been discovered by Capt. Lukens, of the coast and geodetic survey.

The Kuskokwim river is the second greatest river in Alaska. It is nine miles wide at its mouth and navigable for over 600 miles inland. The great submerged flats of the delta of this river extend 100 miles out to sea, and it was through this uncharted delta that the surveying steamer Yukon made the discovery of the channel which means so much to the commerce of that section of Alaska.

The Kuskokwim is one of the three great Alaskan rivers emptying into the Bering sea which has been opened to commerce as a result of the charting operations of the coast and geodetic survey. The mouth of the Yukon was surveyed in 1898, and in a few years that river became one of the greatest commercial arteries of Alaska. In 1909 and 1910 Nushagak bay was charted, and now the Kuskokwim, by far the most dreaded and unknown of these rivers, will no longer be a menace or a mystery to the navigator who has one of the new charts of its entrance about to be issued by the coast and geodetic survey.

Some Difficulties of the Survey

The survey of the Bering sea in the vicinity of the Kuskokwim was started in 1911 and continued the following summers of 1912 and 1913. But it was not until the past field season that a surveying vessel succeeded in tracing and charting channels through the great area of the submerged mud flats which make up the delta of the Kuskokwim.

In making the survey, Capt. Lukens reports he took 14,256 soundings covering an area of over 100 square miles. This in itself is quite an achievement when considered in connection with the customary bad weather in Alaska and the fact that in some instances it was necessary to locate soundings by observations on mountain peaks more than 60 miles distant. The whole working season was confined to 83 days, and in July alone 29½ of these days were lost on account of the weather being either bad or not sufficiently clear to see the distant surveying marks.

When the new coast and geodetic survey chart showing the newly discovered channel is issued, it will be possible for steamship companies to send vessels to the Kuskokwim and

Generated on 2024-07-26 09:50 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ESTABLISHED 1844
A. SCHRADER'S SON, Inc.
783-791 ATLANTIC AVE., BROOKLYN, N. Y.
Manufacturer of
Diving Apparatus

HIGHEST AWARDS
GOLD MEDAL at Jamestown Exposition 1907
GRAND PRIZE at Alaska Yukon Pacific Exposition 1909
LARGE STOCK ALWAYS ON HAND
Furnishers to U. S. Navy and U. S. Army Engineer Corps.
Outfits for Contractors, Waterworks, Sponge and Pearl Fishers, etc.

CATALOGS WANTED

We are requested to inform the INDUSTRIALS of all branches that our French contemporary, "LE MOIS SCIENTIFIQUE ET INDUSTRIEL" of 8 rue Nouvelle at PARIS, 9°, has established an Information Branch from which particulars on any question may be obtained.

It is of great interest for all manufacturers to send regularly their "Catalogues" to "Le Mois Scientifique et Industriel" from where they will be forwarded to every one interested in the line.

Do not delay to send them and note the address is

LE MOIS SCIENTIFIQUE ET INDUSTRIEL
8 rue Nouvelle at Paris--9°
Ask for a specimen notice free on application.

McArthur Jacob's Ladder

This ladder embraces several new features which have been dictated by experience and is the ideal ladder for use aboard ship.

It is now made in sections of any desired length. The sections can be instantly connected by means of snap hooks, adapting the ladder to light or loaded conditions of ships and eliminating the telescopic feature of the former type.

The cable is of plow steel combining lightness with great strength; the steps stamped sheet metal with two-tooth prongs giving a firm foothold; hooks bronze and rivets copper.

The ladder can be compactly rolled up for storage.

"We beg to advise that the Jacob's Ladder furnished the steamer Castalia during season 1913 has proven very satisfactory indeed. The master, Capt. W. L. Girardin, reports that these ladders should be installed on all the boats as they are very efficient and much safer than the old style roper ladder."
The Brown Steamship Company, Cleveland.

McArthur Portable Fire Escape Co.
CLEVELAND OHIO

Lifeboats, Rafts, Davits
Famous for their QUALITY and ECONOMY
CATALOG ON REQUEST
WELIN MARINE EQUIPMENT CO.
305 Vernon Avenue LONG ISLAND CITY, N. Y.

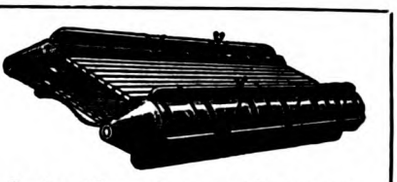
LIFE PRESERVERS
Cork Cushions, Fenders, Cork Ring Buoys
"Ye Oldest Cork House in America"
ESTABLISHED 1865
JUSTUS BRAUER & SON
129 Arch Street Incorporated Philadelphia, Pa.

ANDREW J. MORSE & SON, Inc.
221 High Street BOSTON, MASS.
ESTABLISHED 1837
Diving Apparatus and Submarine Armor
Fire Department Supplies
The Morse Monitor Nozzle

LANE LIFE BOATS
C.M. LANE LIFE BOAT CO.

250 HURON ST. BROOKLYN, N. Y.
LAST LONGEST

THOS. DREIN & SON COMPANY
Established 1866
WILMINGTON, DEL.
Sole Builders of the
Patent Beaded Bottom Metallic Life Boats, Life Rafts, and Wooden Boats of all classes.



Outfits for Lake Steamers a Specialty

Generated on 2024-07-26 09:51 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

thus initiate the development of the latent mining, fishing and agricultural resources of that region.

The Kuskokwim valley covers many thousands of square miles, and no one can predict with certainty what this practically virgin territory will develop when it is thoroughly prospected, but it is not unreasonable to suppose that the near future will see the Kuskokwim river of commercial importance comparable with that of the Yukon river.

Secretary Redfield states that plans are being made in Seattle for the construction by different companies of two light draught vessels designed especially to take care of the expected development of the commerce of the Kuskokwim river, and that still another shipping firm has already announced sailings to the Kuskokwim at the opening of navigation in the coming spring.

Standard Boiler Specifications

One of the greatest works ever performed by any engineering society is that of the American Society of Mechanical Engineers. This society some four years ago appointed a committee of seven prominent engineers to "formulate standard specifications for boilers and other pressure vessels and for care of same in service", since they realized that some strenuous efforts must be made to put an end to the increasing number of boiler explosions in this country and the resultant fearful toll of death and destruction.

The members of this boiler code committee upon their appointment immediately set to work to draw up according to their best judgment a set of rules which would specify boilers of such high type that boiler explosions would be reduced to a minimum and thus effect a maximum protection to human life and property.

Each member gave unstintingly of his time and money to make this formulation of rules a success and after three years of the most effective research work, a preliminary draft of rules was drawn up and sent confidentially to professors of engineering in the best technical schools of this country, superintendents of inspection departments of insurance companies, chief inspectors in charge of United States, state and municipal boiler inspection departments, prominent engineers known to be interested in the construction and safe operation of steam boilers, prominent manufacturers of steam boilers and editors of engineering journals—some 2,000 persons. Each one was invited to read over this report, criticize the same and make suggestions if they so desired. This was done in order that the best engineers in this country and Europe might check the work and submit their suggestions, if any, so that when the boiler code was finally drawn up, it would contain the last word in the art of boiler construction and operation.

The compiling of the data received from this great number of sources naturally consumed a great deal of time and effort on the part of the committee and it has involved countless conferences with large associations and interests in order to arrive at definite conclusions satisfying all those interested.

The magnitude of this work reached such an extent that it was found necessary to appoint an advisory committee of 18 engineers, representing almost as many interests, to assist the original boiler code committee in the final revision of their rules on the construction for stationary boilers and their allowable working pressures.

This advisory committee was appointed in December and from that time until the middle of February they worked incessantly, day and night, until the report was finally completed.

This report was presented to the Council of the American Society of Mechanical Engineers, Feb. 13, 1915, and the council voted unanimously to accept the report, and further than that, they voted to make the boiler code committee and its advisory committee permanent under the name of the Boiler Code Committee of the American Society of Mechanical Engineers.

This standard will be ready for the public in a very short time and there is no doubt but what there will be a great demand for this very complete code of rules.

The cost of the preparation of this work has been enormous and it has been stated that if it was paid for at the ordinary professional rates, it would have cost between $200,000 and $250,000.

This standard adopted as it is by the American Society of Mechanical Engineers, should become universal throughout the country, which, as any one would agree, would be far better than if each state has a separate and different code of rules. Many of the states now have under serious consideration the adoption of this boiler code.

The 75-foot tug Chickamauga was recently launched by Nielsen & Kelez, Seattle, Wash. The tug is said to be the first Diesel powered tug in America.

Canada's Gift to Capt. Uberroth

The house of representatives at Washington has passed a senate bill authorizing the state department to deliver to Capt. Preston H. Uberroth, of Philadelphia, and Carl Johannson, a gunner, both of the revenue cutter service, watches presented by the Canadian government for their bravery in saving the lives of the crew of the wrecked British schooner, S. A. Founds, on Dec. 16, 1910.

In recognition of the gallant act of the two men, the Dominion government decided to give them a substantial reward and handsome watches were purchased. Because of a constitutional provision that gifts from foreign powers may be accepted by persons in the United States government service only by consent of congress, the watches were turned over to the state department, pending action.

The President signed the act on Feb. 18, last. During the past year the secretary of the treasury awarded nine life saving medals of honor to the men in the boat which Captain Uberroth dispatched to the rescue of the crew of the British vessel, after he had reached the scene of disaster on Nantucket Shoals, Mass., with his ship during a severe blizzard, which swept the New England coast for four consecutive days.

Southwark-Harris Valveless Engine

The Southwark Foundry & Machine Co., Philadelphia, Pa., have secured the exclusive United States license to manufacture the Harris Valveless Engine, Diesel principle, which will hereafter be known as the Southwark-Harris Valveless Engine. The engine will be built in sizes from 75 brake horsepower to 1,000 brake horsepower for both marine and stationary service. Leonard B. Harris, the inventor of the Harris valveless engine will be associated with the company as consulting engineer and naval architect. J. P. Johnston who has been interested in and connected with the development of the Harris valveless engine will also be associated with the company in charge of oil engine sales. The company will also continue to manufacture a full line of steam turbines, direct current generators, alternating current generators, air compressors, centrifugal blowers, turbine pumps, hydraulic pumps, hydraulic presses, steam hydraulic presses, surface condensers, jet condensers, barometric and air pumps.

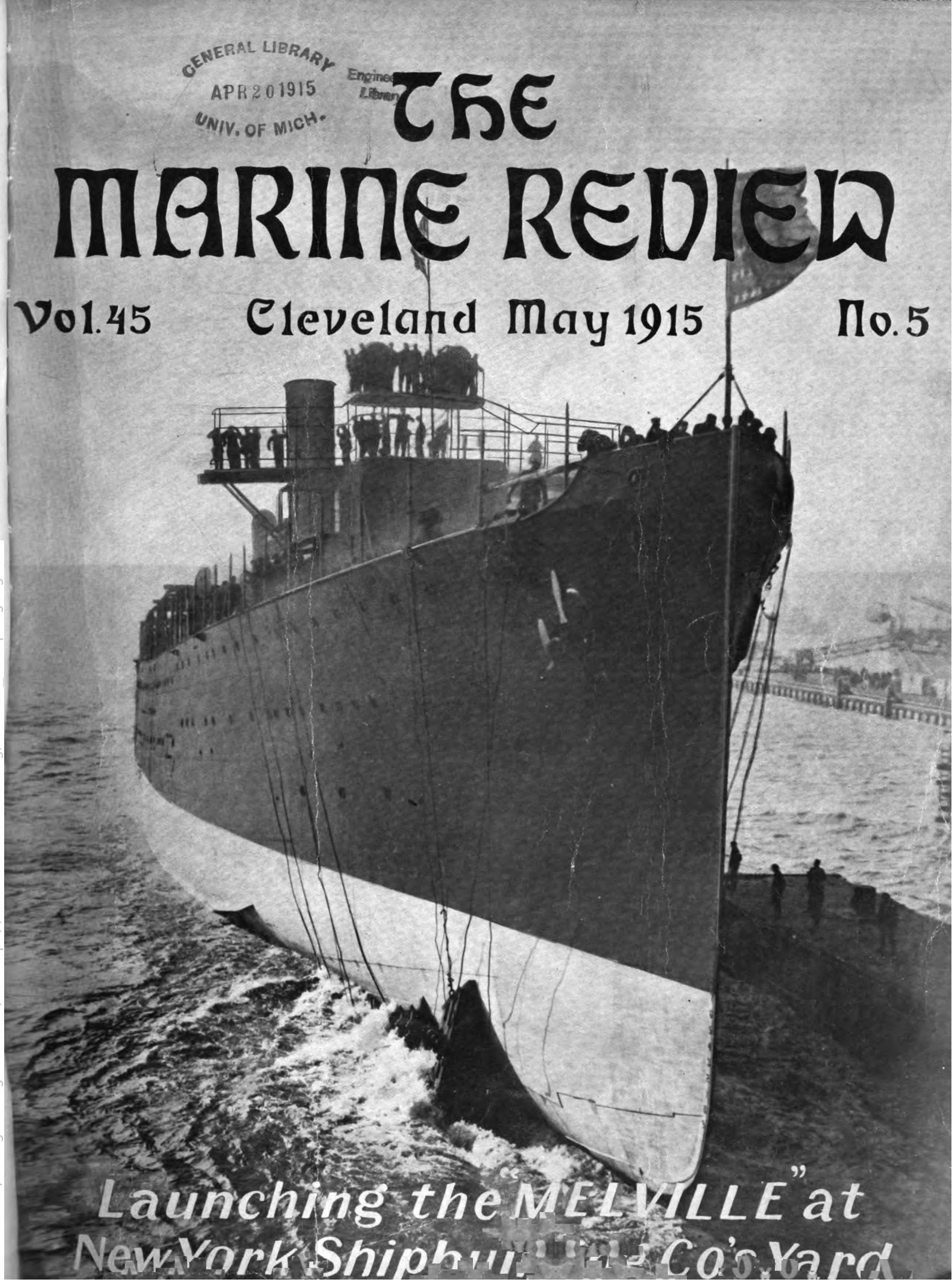
The Bath Iron Works, Bath, Me., is building a new steam yacht for Peter W. Rouss to be 225 feet long. The propelling machinery is to consist of oil-burning turbine engines.

Generated on 2024-07-26 09:51 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

GENERAL LIBRARY
APR 20 1915
UNIV. OF MICH.

THE MARINE REVIEW

Vol. 45 Cleveland May 1915 No. 5



Launching the "MELVILLE" at New York Shipbuilding Co's Yard

Generated on 2024-07-26 09:51 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Morison Suspension Boiler Furnaces

For Land and Marine Boilers

Uniform Thickness **Easily Cleaned** **Unexcelled for Strength**

Also FOX CORRUGATED FURNACES

Manufactured by

THE CONTINENTAL IRON WORKS

West and Calyer Sts., BOROUGH OF BROOKLYN, NEW YORK

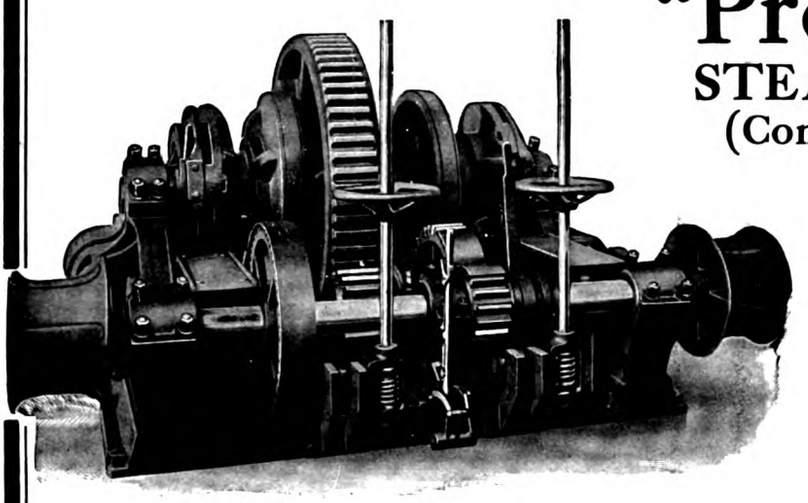
Near 10th and 23rd St. Ferries

"Having a PULL means having a friend in power who will act as a steam windlass for you." The

"Providence"

STEAM WINDLASS

(Compound Spur Gears)



has another kind of *pull*, and plenty of it. It has 15 per cent more *pull* than the worm geared types and at 50 per cent faster speed. You have been looking for just this combination. Our price will please you, too.

Write us today.

AMERICAN ENGINEERING COMPANY

SUCCESSORS TO AMERICAN SHIP WINDLASS CO. AND WILLIAMSON BROS. CO.

MACHINISTS AND FOUNDERS

PHILADELPHIA

15-321

Generated on 2024-07-26 09:51 GMT / https://hdl.handle.net/2027/mdp.39015043584484
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN